(2)

AD_____

CONTRACT NO: DAMD17-88-C-8054

TITLE: EVALUATION OF PHYSIOLOGICAL AND PSYCHOLOGICAL IMPAIRMENT OF HUMAN PERFORMANCE IN COLD STRESSED SUBJECTS

PRINCIPAL INVESTIGATOR: Lorentz E. Wittmers, Jr.
Richard Hoffman

CONTRACTING ORGANIZATION: University of Minnesota
Department of Medical and Molecular Physiology
School of Medicine
10 University Drive
Duluth, Minnesota 55812-2487

REPORT DATE: June 5, 1993

TYPE OF REPORT: Final Report

PREPARED FOR: U.S. Army Medical Research and Development Command, Fort Detrick
Frederick, Maryland 21702-5012

DISTRIBUTION STATEMENT: Approved for public release; distribution unlimited

The findings in this report are not to be construed as an official Department of the Army position unless so designated by other authorized documents.

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION: Unclassified	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION / AVAILABILITY OF REPORT: Approved for public release; distribution unlimited
2b. DECLASSIFICATION / DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S)	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION: University of Minnesota Dept. of Medical & Molecular Physiology 6b. OFFICE SYMBOL (If applicable)	7a. NAME OF MONITORING ORGANIZATION
6c. ADDRESS (City, State, and ZIP Code): School of Medicine 10 University Drive Duluth, Minnesota 55812-2487	7b. ADDRESS (City, State, and ZIP Code)
8a. NAME OF FUNDING / SPONSORING ORGANIZATION: U.S. Army Medical Research & Development Command 8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER: Contract No. DAMD17-88-C-8054
8c. ADDRESS (City, State, and ZIP Code): Fort Detrick Frederick, Maryland 21702-5012	10 SOURCE OF FUNDING NUMBERS

PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.	WORK UNIT ACCESSION NO.
62787A	3016 2787A879	BB	081

11. TITLE (Include Security Classification)
Evaluation of Physiological and Psychological Impairment of Human Performance in Cold Stressed Subjects

12. PERSONAL AUTHOR(S)
Lorentz E. Wittmers and Richard Hoffman

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
Final Report	FROM 5/9/88 TO 5/8/92	June 5, 1993	

16. SUPPLEMENTARY NOTATION

17. COSATI CODES		
FIELD	GROUP	SUB-GROUP

18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
shivering, motor speed, motor skill, military tasks, performance, cold exposure, temperature regulation, metabolism, cardiovascular response, respiratory response, perception, electromyogram, muscle activity, rifle shooting

(continued on reverse)

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

The effects of 2 shiver suppression techniques on performance of military relevant motor tasks, body heat conservation, and metabolic functions during cold exposure were investigated using a repeated measures MANOVA design. Nine male voluntereers, 24.3±0.8 yr, were exposed for 3 hours to 3 conditions: 1) warm [W] = 21°C air; 2) Cold [C] = -7°C air; and 3) Shiver suppression [SS] = -7°C air with shiver suppression techniques (breath holding and voluntary relaxation) applied. Motor speed and accuracy tasks included rifle and pistol shooting and reloading, magazine reloading. Rectal temperature decreased more during SS than in W or C. Skin temperatures and temperature perceptions in C and SS declined more than W, but were similar to each other. Heart rate decreased in W and increased in C and SS. Performance on motor tasks showed decrements with both C and SS. Decrements in rifle reloading and pistol reloading were less in SS than in C. Decrements in rifle and pistol shooting performance were greater in SS than in C. Decrements in magazine loading were not significantly different in SS and C. In conclusion, SS caused a decline in core temperature, and an improvement in cold exposure performance in simple repetative motor tasks involving little concentration, but a decrement in performance in tasks which required more mental concentration.

20. DISTRIBUTION / AVAILABILITY OF ABSTRACT	21. ABSTRACT SECURITY CLASSIFICATION
☐ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT. ☐ DTIC USERS	Unclassified

22a. NAME OF RESPONSIBLE INDIVIDUAL	22b TELEPHONE (Include Area Code)	22c. OFFICE SYMBOL
Mrs. Virginia Miller	301-619-7328	SGRD-RMI-S

DD Form 1473, JUN 86 *Previous editions are obsolete.* SECURITY CLASSIFICATION OF THIS PAGE

SUBJECT TERMS (continued)

pistol shooting, rifle loading, pistol loading, magazine loading, rectal temperature, skin temperature

FOREWORD

Opinions, interpretations, conclusions and recommendations are those of the author and are not necessarily endorsed by the U.S. Army.

_____ Where copyrighted material is quoted, permission has been obtained to use such material.

_____ Where material from documents designated for limited distribution is quoted, permission has been obtained to use the material.

✓ Citations of commercial organizations and trade names in this report do not constitute an official Department of the Army endorsement or approval of the products or services of these organizations.

_____ In conducting research using animals, the investigator(s) adhered to the "Guide for the Care and Use of Laboratory Animals," prepared by the Committee on Care and Use of Laboratory Animals of the Institute of Laboratory Animal Resources, National Research Council (NIH Publication No. 86-23, Revised 1985).

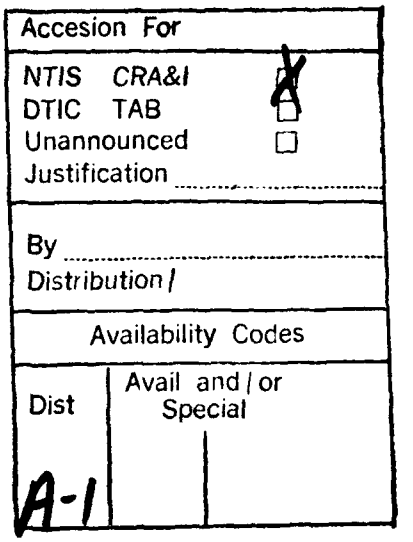
✓ For the protection of human subjects, the investigator(s) have adhered to policies of applicable Federal Law 45CFR46.

_____ In conducting research utilizing recombinant DNA technology, the investigator(s) adhered to current guidelines promulgated by the National Institutes of Health.

Lorenz E. Wittmer 6/2/93
PI Signature Date

SUBJECT TERMS (continued)

pistol shooting, rifle loading, pistol loading, magazine loading, rectal temperature, skin temperature



Final Report

Evaluation of Physiological and Psychological Impairment of Human Performance in Cold Stressed Subject

Contract #DAMD17-88-C-8054

Submitted to: United States Department of the Army

Submitted by: Lorentz E. Wittmers, Jr., Ph.D.
Department of Physiology
University of Minnesota - Duluth School of Medicine
Duluth, Minnesota 55812

Richard Hoffman, Ph.D.
Department of Behavioral Sciences
University of Minnesota - Duluth School of Medicine
Duluth, Minnesota 55812

Table of Contents

List of Figures

List of Tables

List of Appendices

Introduction

Military personnel in the field are frequently exposed to cold air and cold water in combination with sleep deprivation and/or exercise. Under these stressful conditions, they are required to think clearly and have good motor control and weapons accuracy. Phase I of this study reported on the possible augmenting effect of the combination of sleep deprivation and exercise on the expression of shivering, fine motor control and cognitive performance. This included an evaluation of the magnitude of shivering and voluntary shiver suppression following cold air/cold water exposure, with and without exercise and/or sleep deprivation. The protocol also evaluated the effects of cold stress on rifle shooting performance (rate of fire, accuracy, and judgment), and subjects' performance on a battery of command and control relevant cognitive tasks. The relationship of cold exposure and shivering to the ventilatory cycle was also examined, as well as the relative effects of various cold stressors on urinary catecholamine production as a possible estimate of the magnitude of overall stress. These results were detailed in a midterm report entitled "Evaluation of Physiological and Psychological Impairment of Human Performance in Cold Stressed Subjects," submitted March 23, 1990.

In Phase II of this study, the two most effective shiver suppression techniques (determined in Phase I) were performed in combination with military motor speed and accuracy tasks during a more severe cold stress, in order to evaluate the effect of the shiver suppression on fine and gross motor performance. There is no mention of this application of shiver suppression in the literature, and the effects of intermittent shiver suppression over several hours of cold exposure are unknown. These studies have broken new ground in the practical application of voluntary control of stress reactions that typically result in performance

decrements, and have provided useful insights into improvement of human performance under environmental stress.

Historical Review:

During cold exposure, activation of peripheral cold receptors and central thermosensitive structures generates afferent inputs to thermoregulatory centers. In mammals the hypothalamus contains the primary thermoregulatory control center, however, sub-hypothalamic areas of the brainstem and spinal cord are also involved in converting thermal input signals to efferent signals which control thermoregulatory effectors (35). Activation of these centers initiates and maintains the efferent neuronal signals that increase muscle activity to produce heat and modify posture to minimize heat loss (17, 25, 33). As the cold stimulus increases, muscle activity progresses from increased tone without visible tremor (preshivering tone) to visible shivering that is characterized by bursts of tremor.

Fully developed shivering exhibits a species specific rhythm resulting from the grouped discharge of motor units (20). It is believed that these grouped discharges are generated at the spinal cord level since they have not been observed in the descending supra-spinal drive for shivering (2,3,37), and because shivering can be elicited in spinal transectioned dogs and rabbits by cooling of the spinal cord (23,34). Thus it appears that shivering is controlled or modulated by both central and spinal mechanisms.

Although shivering is considered an involuntary response, like respiration, it can be temporarily suppressed or inhibited (17). Several investigators have noted that at low intensities, shivering can be temporarily suppressed by voluntary relaxation and breath holding (11,14,39). Glickman, et al. (16) reported that even after 4 hours of exposure to -29.9°C air, his subjects were able to effectively suppress shivering by relaxing.

In addition to voluntary relaxation, shivering can be suppressed by a number of other non-thermoregulatory mechanisms. Martin and Cooper (27), and Klenow et al. (21) noted that

shivering, as measured by EMG activity, consistently decreased during a mental arithmetic task, while isometric muscle contractions resulted in variable effects. Burton and Bronk (7) noted that the intensity of shivering is affected by respiration, increasing on inspiration and decreasing on expiration. The latter suggests a thermoregulatory reflex involving thermoreceptors in the upper airways which are cooled on inspiration and warmed on expiration (9). Other non-thermal sensory stimuli that are known to suppress the shivering response in mammals include mechanical pressure on the eyeball, mechanical pressure on the skin (10,22), stretching a muscle (7,17), and electrical stimulation of cutaneous nerves at frequencies below 50 Hz (22). Cardiovascular and respiratory reflexes also modulate the shivering response. Low carotid sinus pressure (18,30), lung inflation (30) hypoxia (6,12,15), and hypercapnia (6,13) have all been demonstrated to inhibit shivering. Noxious stimuli such as twisting the pinna (40), pin pricks, and blowing on the hair of the back, have been reported to increase shivering intensity (22). Electrical cutaneous nerve stimulation at frequencies above 50 Hz has also been shown to increase shivering.

The muscle tension and tremor of shivering may impede performance in individuals who must undertake tasks that involve motor speed and accuracy in a cold environment. Outdoor sportsmen under emergency conditions, commuters caught unaware of severe weather, or military personnel who must perform operations under extreme weather conditions are some examples of critical situations when loss of fine motor control or speed could prove disastrous. Therefore, it may be useful to develop techniques to improve cold weather performance, and temporary suppression of shivering during fine motor tasks may be one such useful technique. Indeed some shiver suppression techniques are already being applied. For example, breath holding while shooting is a standard marksmanship technique, and mental concentration on a task may unconsciously inhibit shivering. Hemingway, et al. (17) has suggested that some suppression of shivering takes place whenever any voluntary movement is initiated.

There are no previous reports in the literature in which shiver suppression has been applied to improve motor performance. The purpose of these experiments, therefore, is to evaluate the effectiveness of the two best shiver suppression techniques (as determined in Phase I) on the performance of militarily relevant motor tasks.

Body

Methods

Subjects:

Male volunteers, 21 to 29 years old, were solicited from Minnesota National Guard units, local law enforcement agencies, and military reserve units (Air Force, Army and Navy). Potential subjects were recruited from the aforementioned groups because it was deemed necessary that they be qualified in the use of firearms (AR15-2 or equivalent , and Smith & Wesson .357 revolver or equivalent) prior to participation. It was felt that this would minimize any training or learning effect that might occur during the course of the experiments. Each potential subject was informed as to the general purpose, procedure, and possible risks of the experiments and gave his written consent prior to any further screening. A copy of the informed consent document is included as Appendix I. Protocols for this project had been approved by the University of Minnesota Committee for the Use of Human Subjects and the United States Army prior to the onset of subject recruitment. Anthropomorphic data for the final subject pool is contained in Table 1.

Table 1.

Subject Anthropomorphic Data

Subject #	*Height (cm)*	*Weight (kg)*	*Age (yrs)*	*% Body Fat*	*Resting Heart Rate (bpm)*	*Stress Test Heart Rate (bpm)*	*Systolic BP (mmHg)*	*Diastolic BP (mmHg)*
1	188	83.9	27	21.1	72	165	118	70
2	173	58.6	24	8.5	60	176	116	64
3	175	79.8	29	11.7	60	140	110	78
4	183	96.7	22	12.6	76	175	124	74
5	178	70.9	25	9.8	76	170	132	64
6	173	80.4	24	13.7	68	140	126	72
7	179	80.9	23	16.3	100	145	108	62
8	175	64.1	21	10.7	60	125	110	62
9	180	71.4	24	17.7	76	170	124	70
mean	178.2	76.3	24.3	13.6	72	156.2	118.7	68.4

Selection and Screening:

Volunteers were first given a 12-lead Electrocardiogram (ECG) which was interpreted by a physician from the Department of Clinical Sciences, University of Minnesota Duluth School of Medicine. Percent body fat was estimated by hydrostatic weighing and calculated using the Brozek formula (5). Volunteers with normal ECG's, body fats below 25%, and using no prescription medications were accepted for further screening.

Volunteers then underwent a treadmill exercise test, employing a modified Balke protocol (4). This involved walking on a treadmill at a speed of 3 mph starting at a 2% grade. The grade was increased by 2%, every two minutes, to a maximum of 18%. Blood pressure and heart rate were recorded during the last 30 seconds at each grade. Any volunteer was disqualified from further participation in the study if his heart rate exceeded 90% of his age predicted maximum, his systolic blood pressure exceeded 200 mmHg or his diastolic blood pressure exceeded 100 mmHg before reaching the 18% grade.

Subjects who passed all of the above screening criteria were familiarized with the laboratory and experimental protocols prior to active participation in any experiments.

Experimental Conditions:

All experiments were conducted in a 130 square foot, thermostatically controlled ($\pm$1.0°C), environmental chamber. Each subject participated in the following three experimental conditions presented in a counterbalanced order:

1. Warm (control): Subjects remained in a 21°C chamber for three hours to obtain baseline temperatures and performance levels as outlined below.

2. Cold: Subjects were exposed to an ambient temperature of -7°C for 3 hours to obtain temperatures and performance levels during a cold temperature stress.

3. Shiver Suppression (SST) (Cold with shiver suppression techniques applied): Subjects were exposed to an ambient temperature of -7°C for 3 hours to obtain temperatures and performance levels during a cold temperature stress while employing voluntary shiver suppression techniques during performance of motor speed and accuracy tasks. The total time during which shivering was suppressed comprised approximately 12% of the 3 hour exposure period. Two shiver suppression methods (determined as most the most effective methods in Phase I) were employed:

(1) Breath hold: The subject was instructed to hold his breath while performing the various motor speed and accuracy tasks presented to him.

(2) Relaxation: The subject was instructed to relax his entire body while performing the various motor speed and accuracy tasks.

The subjects were familiarized with each technique before the experiment. Instructions for each shiver suppression method were displayed on a large sign placed in a window of the environmental chamber in front of the subject. The subject's attention was directed to this sign to remind him to use the designated shiver suppression technique before each round of motor tasks began. Shiver suppression techniques were alternated every 30 minutes, starting with breath hold during the first (0 time) measurements.

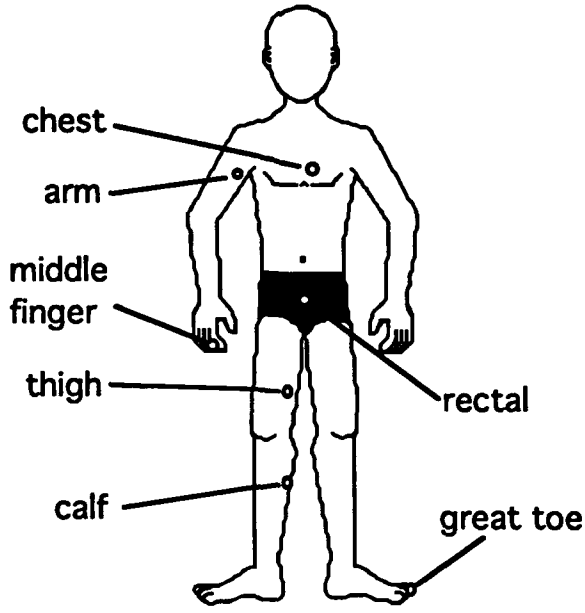
Experimental protocol:

Temperature Measurements:

Rectal temperature (T_R) was monitored with a disposable rectal thermocouple (Type T, PhysioTemp, Inc., Clifton, NJ) inserted approximately 10 cm. beyond the anus. Skin temperatures were monitored using copper-constantan skin thermocouples (#SST-1. Sensortek, Inc., Clifton, NJ) on the medial calf, medial thigh, lateral upper arm, and chest above the medial end of the left clavicle (see Figure 1).

Figure 1

Thermocouple placement



Mean skin temperature (T_{MS}) was calculated employing the approach of Ramanathan (31) as presented in Equation 1.

$$T_{MS} = 0.3(T_{chest} + T_{arm}) + 0.2(T_{calf} + T_{thigh}) \quad (1)$$

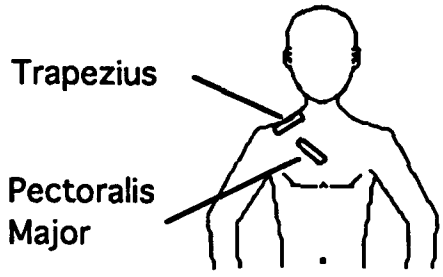
All temperatures were sampled 6 times per minute, and one minute averages were recorded to the nearest 0.1°C using a computerized data acquisition system (Macintosh SE computer from Apple Computer, Inc., Cupertino CA, equipped with an A/D board and Analog Connection Workbench data acquisition software from Strawberry Tree Inc., Sunnyvale, CA).

Electromyographic Measurements:

Surface electromyograms (EMG's) were monitored using Ag/AgCl surface electrodes (#D496-4, AA Biomedical, Windsor CA) over upper trapezius and pectoralis major muscles (Figure 2). Bipolar electrodes were spaced 3 cm apart over the belly of the muscle with the most distal electrode being designated the ground. The skin was cleaned and gently abraded with a pumice impregnated prep pad before application of the electrodes. EMG signals were amplified with a Nicolet Viking EMG system (Nicolet Biomedical Inc., Madison, WI), and recorded on magnetic tape (Hewlett-Packard #3968A Instrumentation Recorder, San Diego, CA) for subsequent analysis.

Figure 2.

EMG electrode placement



After subjects were instrumented at room temperature (approximately 21°C) with skin and rectal thermocouples, ECG transmitter, and EMG electrodes, they donned cotton underwear and socks, cotton/polyester long sleeved shirts, cotton long pants, and warm weather boots. Leads from the ECG, EMG, and temperature sites were attached to harnesses on a belt. The subject could then move about freely without interference from the many individual leads.

EMG Analysis:

Tape recorded EMG signals were sampled at 1024 Hz/channel with an A/D converter, and analyzed utilizing a VAXLAB-GPX™ (Digital Equipment Corp., Maynard MA) and ILS™ (Signal Technology Inc., Goleta CA) software. Root Mean Square voltage (RMS)

values (Equation 2) were calculated for approximately 30 second segments of continuous data.

$$RMS = \sqrt{\frac{Y_1^2+Y_2^2+\ldots+Y_n^2}{n}}$$

Y = voltage measured at the sample point
n = total number of sample points analyzed (2)

EMG data samples were taken from the period immediately preceding the first shot for each target in both rifle and pistol shooting tasks, during pistol reloading, and during metabolic rate measurements when no performance tasks (see below) were being done. In the Shiver Suppression condition, shiver suppression techniques were not applied during measurement of metabolic rate.

Respiratory & Metabolic Measurements:

A modified lead 2 ECG was monitored by telemetry (Markham Industries) throughout each experiment to ensure subject safety and to measure heart rates.

Minute ventilation, carbon dioxide production and oxygen consumption were monitored and recorded using an open circuit spirometry sampling system (Rayfield, Ltd.). Blood pressures were measured with a sphygmomanometer and stethoscope.

Performance Measurements:

Four measures of motor speed and accuracy were recorded immediately after entry into the environmental chamber and at 30 minute intervals during the exposure period. Military ammunition pouches, dummy rounds, a laser retrofitted AR15-2 rifle, AR15-2 magazines, and a laser retrofitted Smith and Wesson 0.357 caliber revolver were used for these tests. The above rifle and pistol were part of the FireArms Training System (F.A.T.S., Norcross GA) interactive video firing range used in Phase I of this project. These tests included:

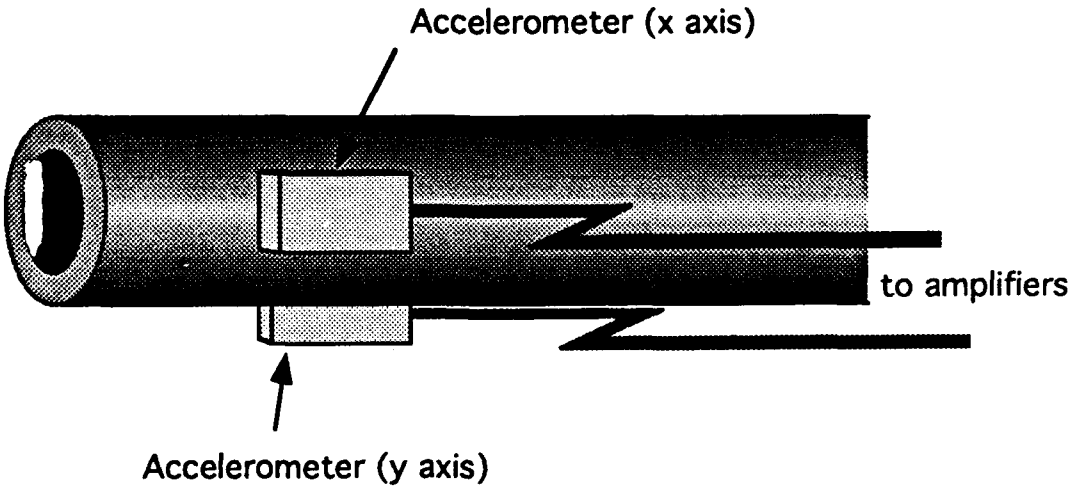
1. Rifle Magazine Loading: Subjects were instructed to load dummy rounds from a belt-mounted ammo pouch into AR15-2 magazines as quickly as possible. They were allowed 60 seconds for this task, and the number of rounds loaded/minute was recorded.

2. Rifle loading time and rifle shooting accuracy: Subjects were instructed to remove a magazine from their belt-mounted ammo pouch, insert it into the rifle, and fire five rounds as accurately as possible at the target, then eject the magazine and repeat the sequence. The target used was a video simulation of a silhouette on a 100 yard firing range projected by the F.A.T.S. system, which also recorded the points of impact on or around the target. They were allowed 120 seconds to fire all 10 rounds.

3. Pistol loading time and pistol shooting accuracy: Subjects were instructed to remove individual rounds from their ammo pouch and load the pistol, then fire 6 rounds at the video target (simulated 100 yards, silhouette target as in 2 above), eject the spent cartridges, reload, and fire six more rounds. They were given 120 seconds to fire all 12 rounds.

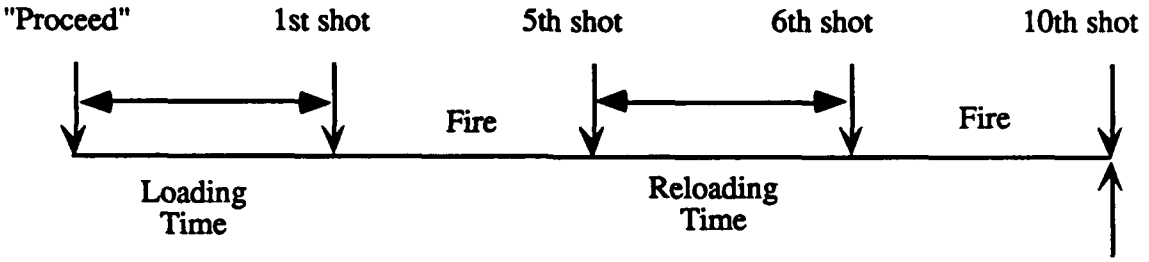
4. Rifle steadiness: Movements of the rifle barrel while shooting were measured with two accelerometers on the rifle barrel oriented in horizontal (x) and vertical (y) planes (see Figure 3).

Figure 3



Performance Analysis:

Times for loading/reloading the rifle were recorded from the "proceed" signal to the first shot, and between the fifth and sixth shots (i.e. between ejection of first magazine and firing of first shot of the second magazine) (see diagram below).



120 seconds maximum

Times for loading/reloading with the pistol were recorded in a similar fashion except that there were 2 groups of 6 shots each so that reloading times were recorded between shots 6 and 7 rather than 5 and 6. Shot groupings for both rifle and pistol were evaluated by calculating the mean distance between shots as a measure of accuracy.

Estimates of steadiness were made by calculating the RMS voltage of the accelerometer output where 10 mV = 1g.

Temperature and Comfort Perception Measurement:

Subjects' perceptions of central and peripheral temperature and degree of cold induced discomfort were evaluated every 30 minutes, immediately before motor performance tests, using the visual analog scales shown in Figure 4-a & b. Subjects were instructed to draw a line on an unmarked 100 mm long scale that reflected how they felt about that particular part of their body. The end points were defined as shown in Figure 4. For evaluation of comfort the range listed was from "uncomfortable" at the 0 point to "comfortable" at 100 mm. Temperature perceptions ranged from "cold" at 0 to "warm" at 100 mm. Separate scales were

marked for "Fingers", "Toes", and "Rest of Body". Subjects were also instructed to try to exclude their fingers and toes when marking their perceptions for "Rest of Body".

Temperature and Comfort Perception Analysis:

Perceptions were analyzed by measuring the distance between the subject's mark on the analog scale and the 0 point ("uncomfortable" or "cold" on the data sheet). Results are presented in mm.

Figure 4 a .

Example Comfort Perception Data Sheet

a.

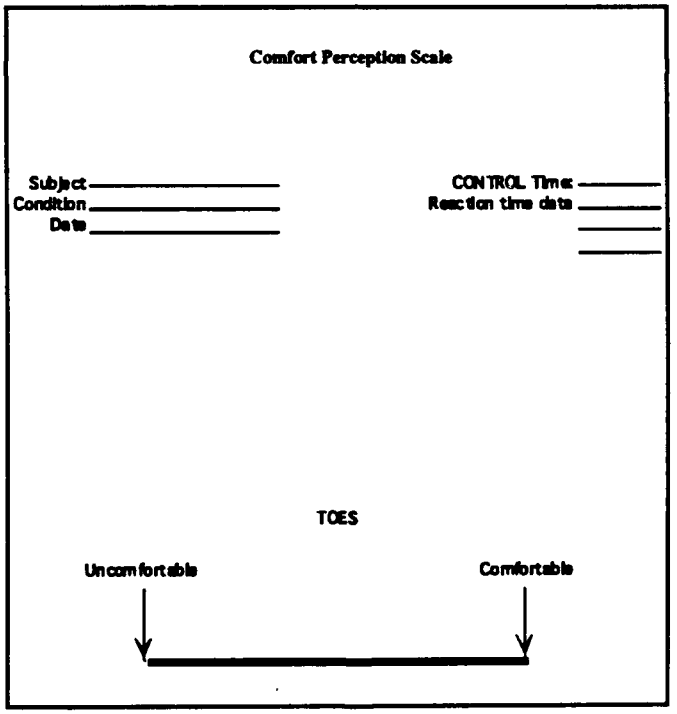
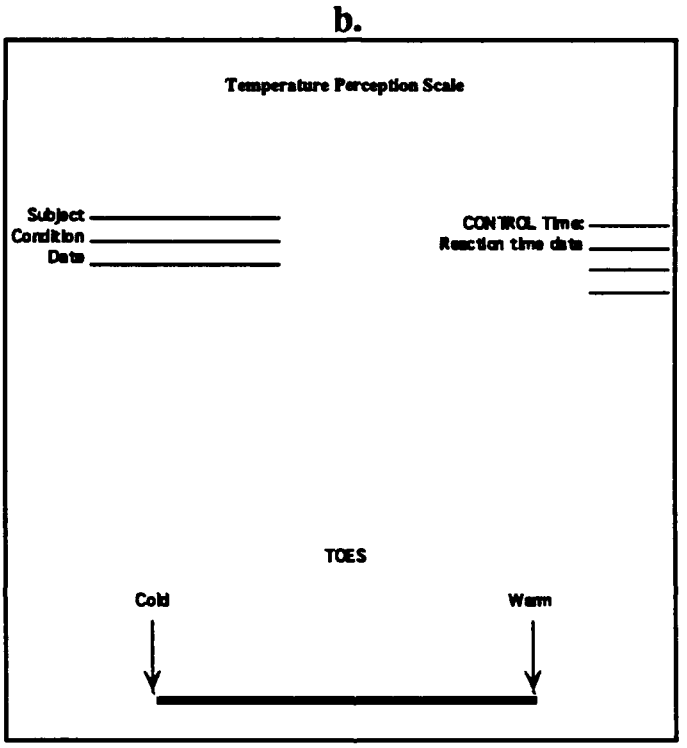


Figure 4 b .

Example Temperature Perception Data Sheet



Upon leaving the chamber at the conclusion of the experiment the subject was disconnected from the electrodes and thermocouples and allowed to leave when he had rewarmed to a comfortable level.

Data compilation:

Detailed data files for all temperature measurements are included in Appendix II. Temperatures are presented as minute to minute values for each of the nine subjects and for each of the three conditions. The mean temperature value for the nine subjects at each minute of exposure is also tabulated. Temperature changes were calculated by determining the difference between starting and ending temperatures of each experiment. Appendices III-V

contain tables with individual subject data from perception, firearms, acceleration and EMG measurements. Mean values of the nine subjects at each time period are also included. Graphical presentation of this data along with appropriate discussion will be included in the results section. Multiple Repeated Measures Analysis of Variance and paired Student's T-tests were applied to evaluate the effect of shiver suppression on motor speed and accuracy tests, rectal and mean skin temperatures, temperature perceptions, rifle steadiness, and muscle EMG activity. Differences were considered to be significant at $p \leq 0.05$.

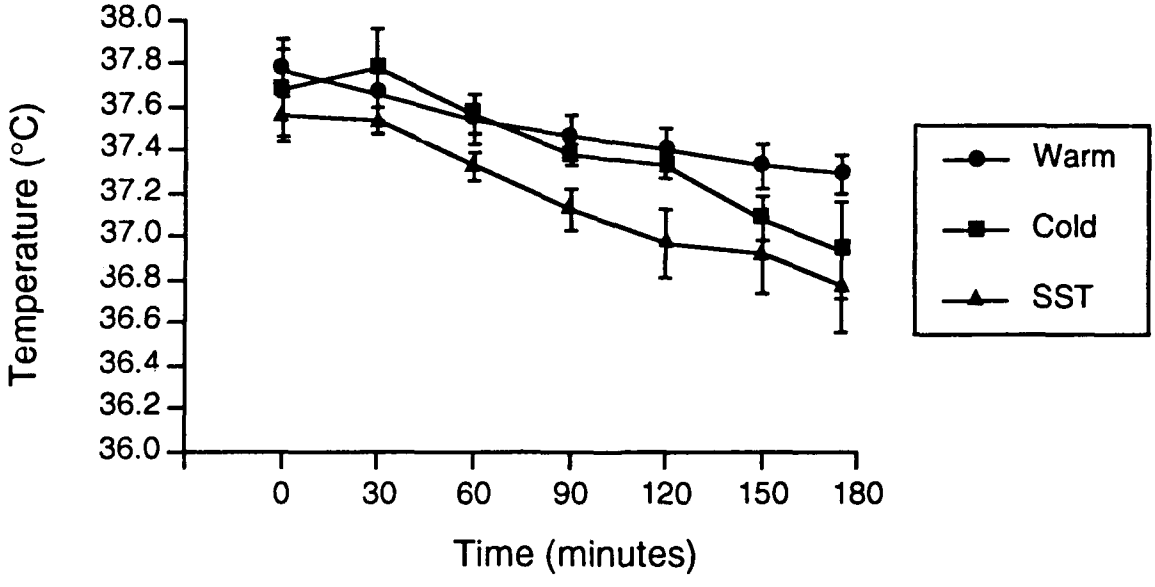
Results:

Core Temperatures:

Subjects' rectal (core) temperatures declined under all three conditions (Figure 5). This decrease in core temperature was minimal in the Warm condition (0.48°C). In the Shiver Suppression condition (SST) the core temperature dropped below that observed in the Cold condition (0.79 °C in the Shiver Suppression condition; 0.67°C in the Cold condition) and remained lower throughout the 180 minute exposure period.

Figure 5.

Rectal Temperatures



Skin Temperatures:

Mean skin temperatures decreased the most during the Cold and Shiver Suppression conditions and changed little during the Warm condition (Figure 6). The individual temperature sites from which mean skin temperature was calculated (Figures 7, 8, 9 & 10), as well as other skin sites monitored (Figures 11, 12, & 13), all demonstrated similar patterns of decline in the Cold and Shiver Suppression conditions.

Figure 6

Mean Skin Temperatures

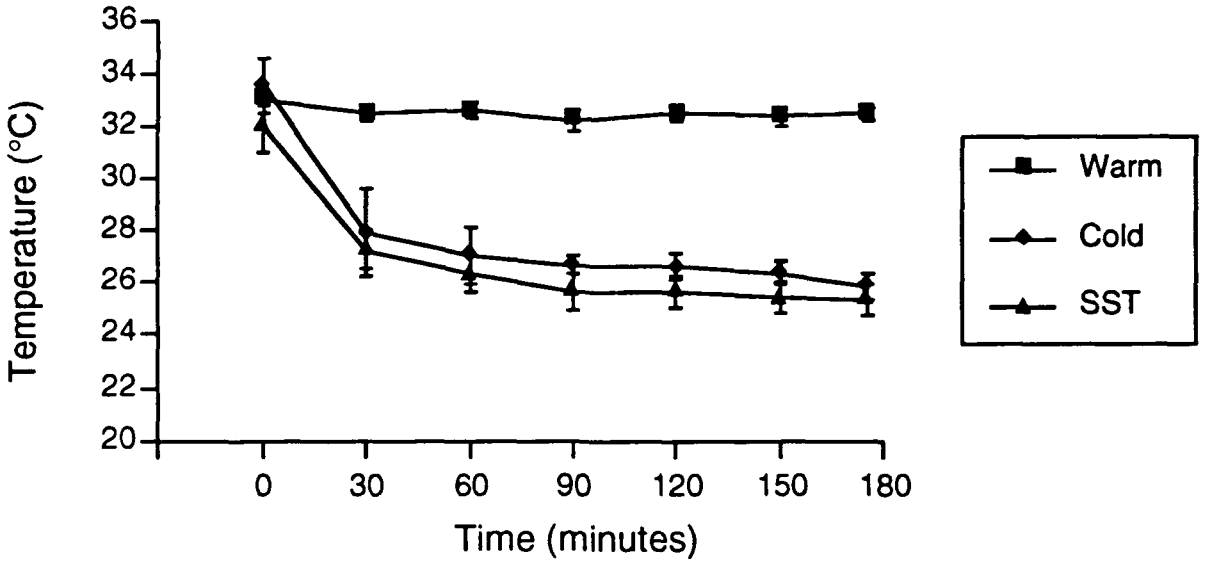


Figure 7

Chest Temperatures

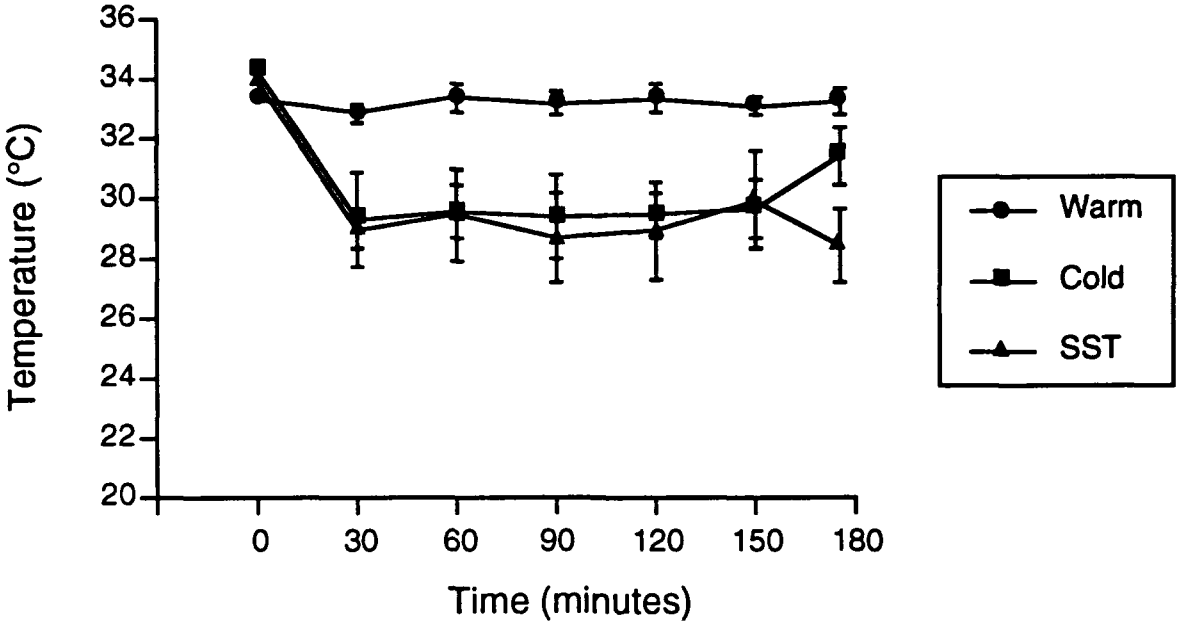


Figure 8

Calf Temperatures

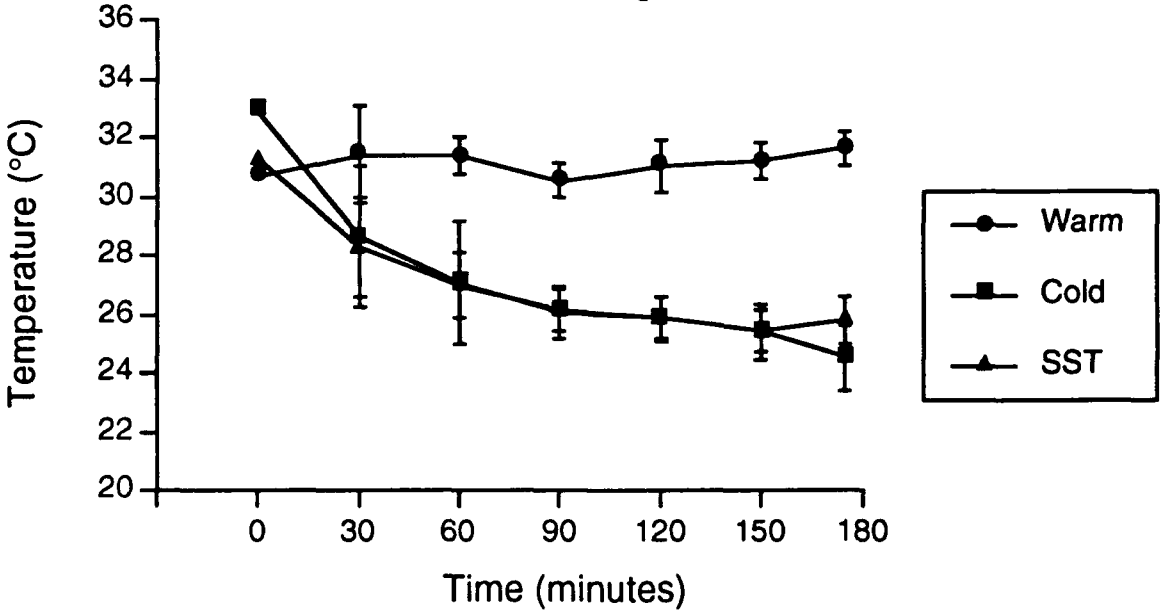


Figure 9

Thigh Temperatures

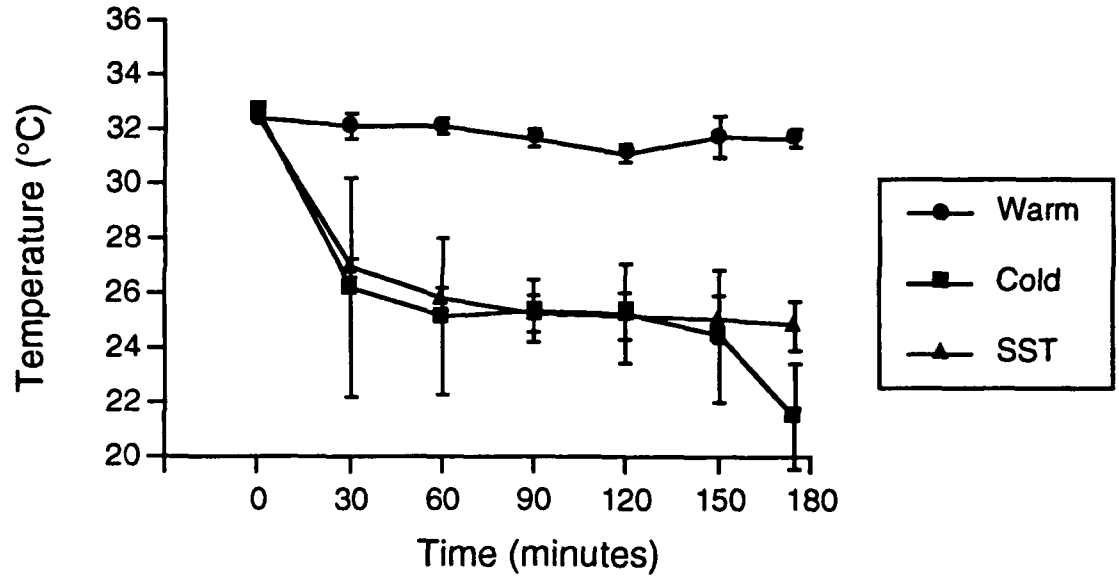


Figure 10

Arm Temperatures

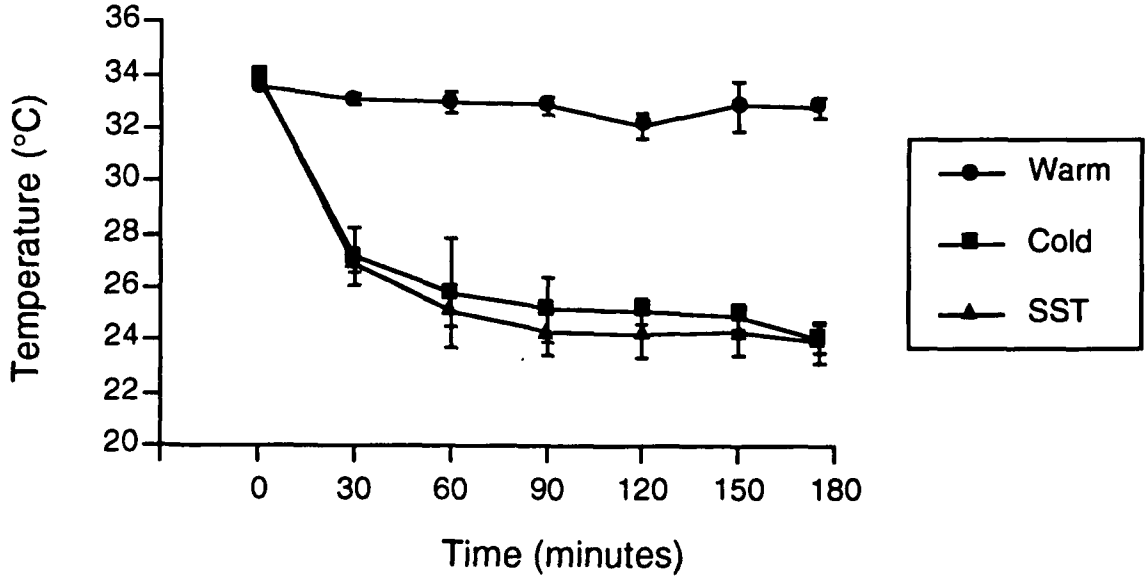


Figure 11

Toe Temperatures

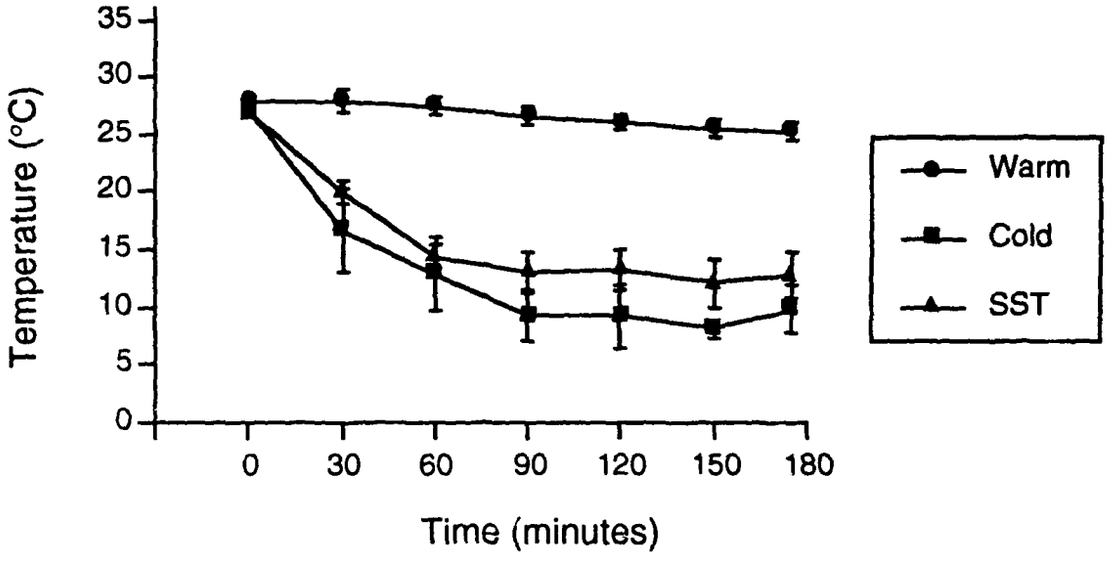


Figure 12

Face Temperatures

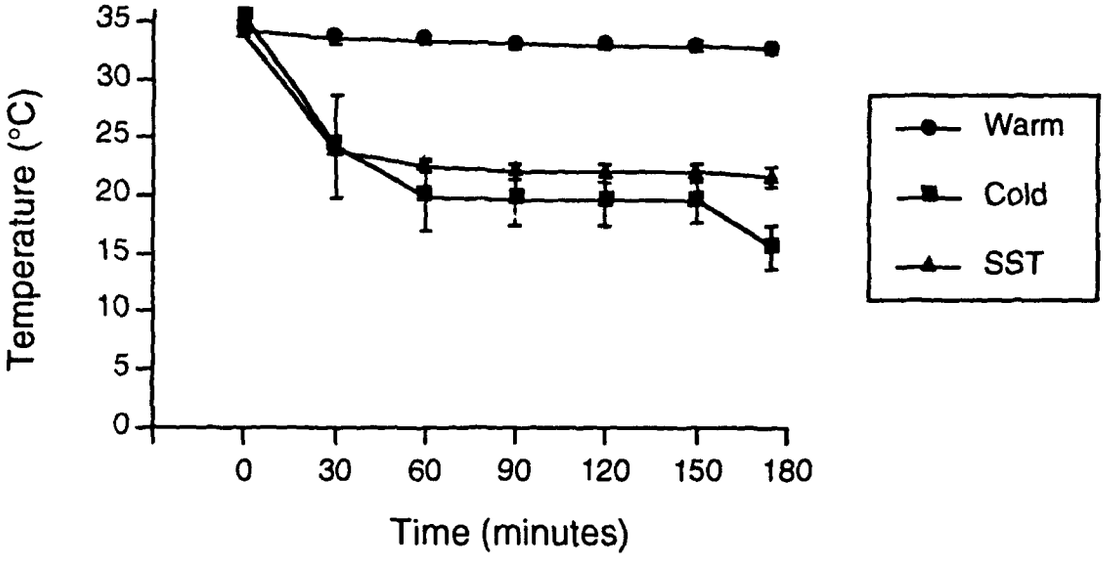


Figure 13

Finger Temperatures

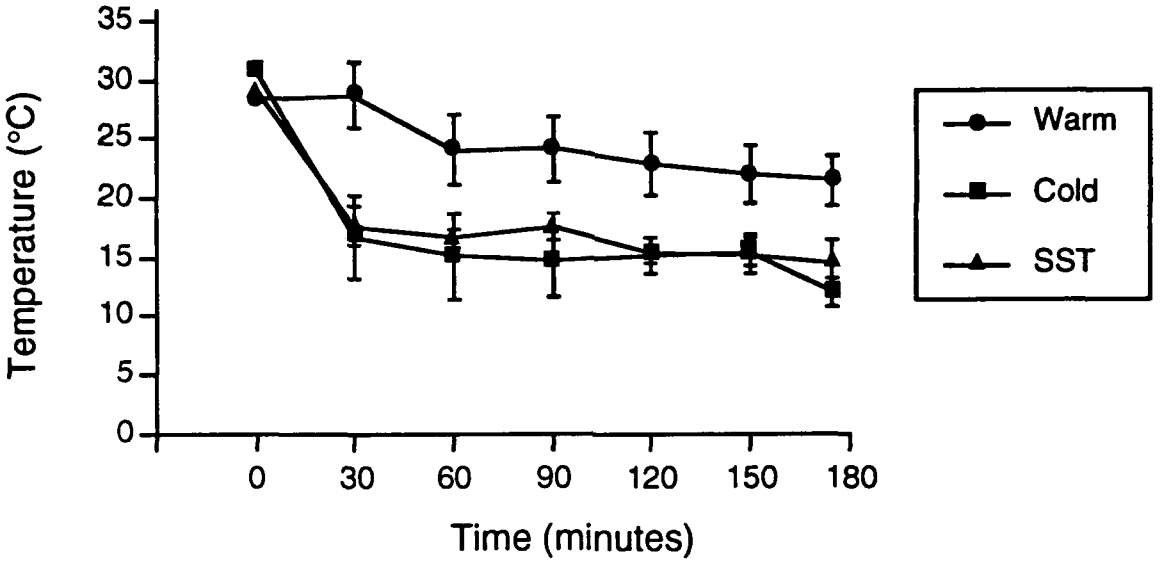


Table 2 summarizes the change in temperatures (rectal, mean skin, toe, face and finger) between the beginning and end of each of the three exposures. The asterisk (*) indicates that the change from the initial (control) value was significantly different at $p \leq 0.05$.

Table 2.

Drop from control temperatures

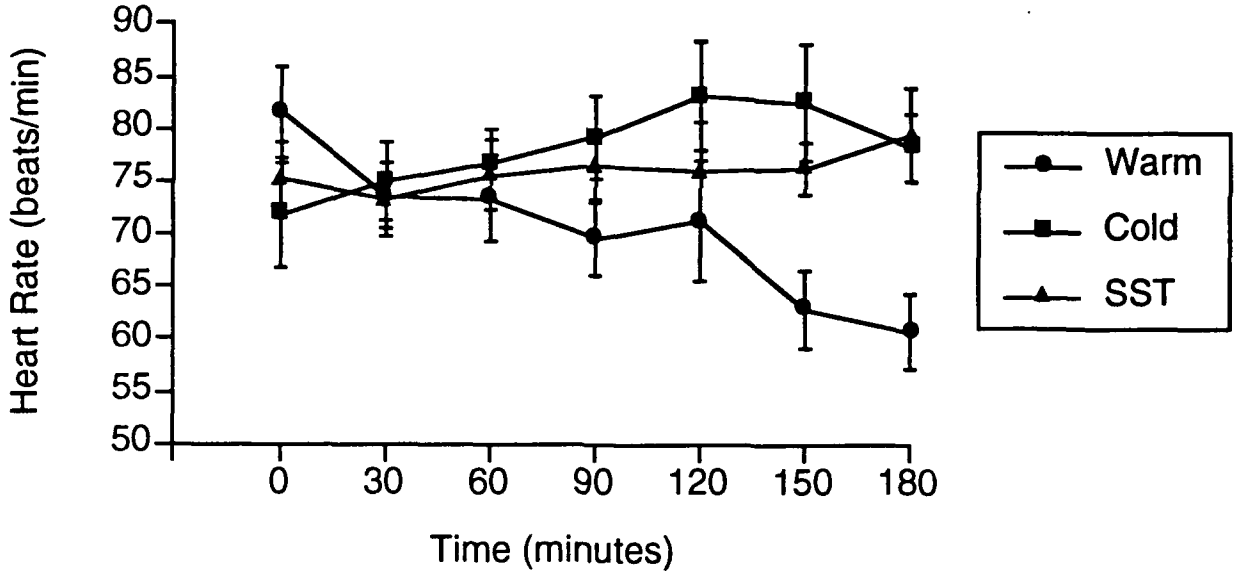
	Rectal	Mean Skin	Toe	Face	Finger
	Δ °C	Δ °C	Δ °C	Δ °C	Δ °C
Warm	-0.48*	-0.53*	-2.7	-1.6	-6.8
Cold	-0.67 *	-7.7*	-17.4	-19.9	-18.7
SST	-0.79 *	-6.2*	-14.1	-12.4	-14.6

Cardiovascular - Respiratory Parameters:

During the Warm condition, heart rate decreased continuously over the three hour test period (Figure 14). On the other hand, for both Cold and Shiver Suppression conditions heart rate increased, with the largest increase occurring in the Shiver Suppression condition (Figure 14).

Figure 14

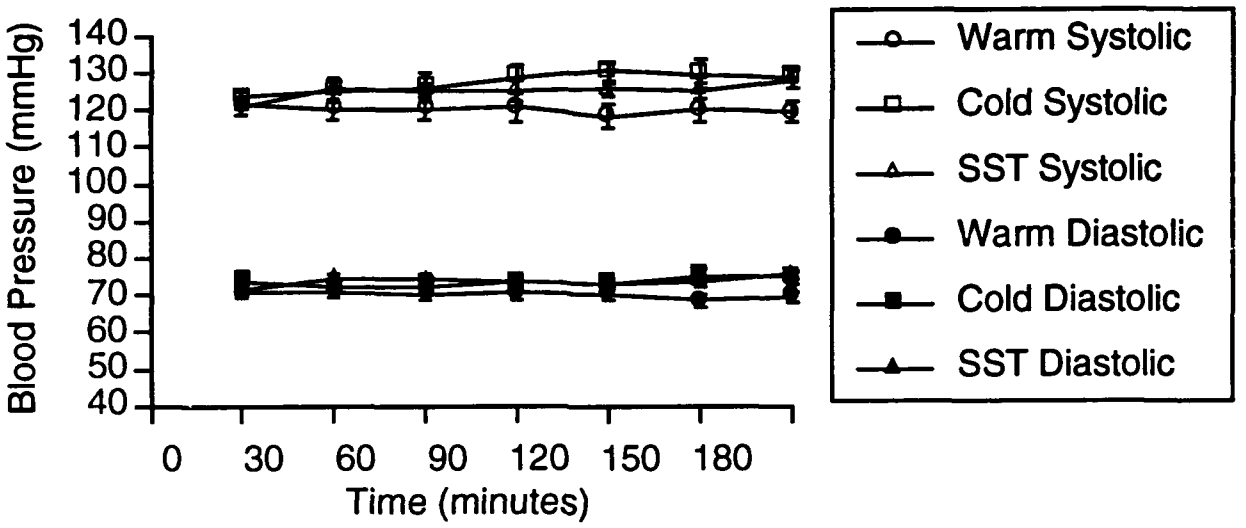
Heart Rate



With respect to blood pressure changes, there were no alterations in diastolic pressure as a function of time of exposure or condition (Figure 15). During the Cold condition there was a small rise in systolic pressure over time. However, there was no significant difference between the systolic pressure in the Cold and Shiver Suppression conditions, or between the Cold or Shiver Suppression conditions when compared to the Warm condition.

Figure 15

Blood Pressure



Minute ventilation (Equation 3) remained constant during the Warm condition, but did show a significant rise (maximum value of 20 L/min) in both Cold and Shiver Suppression conditions (Figure 16).

$$\dot{V}_E = \bar{V}_T * f \qquad (3)$$

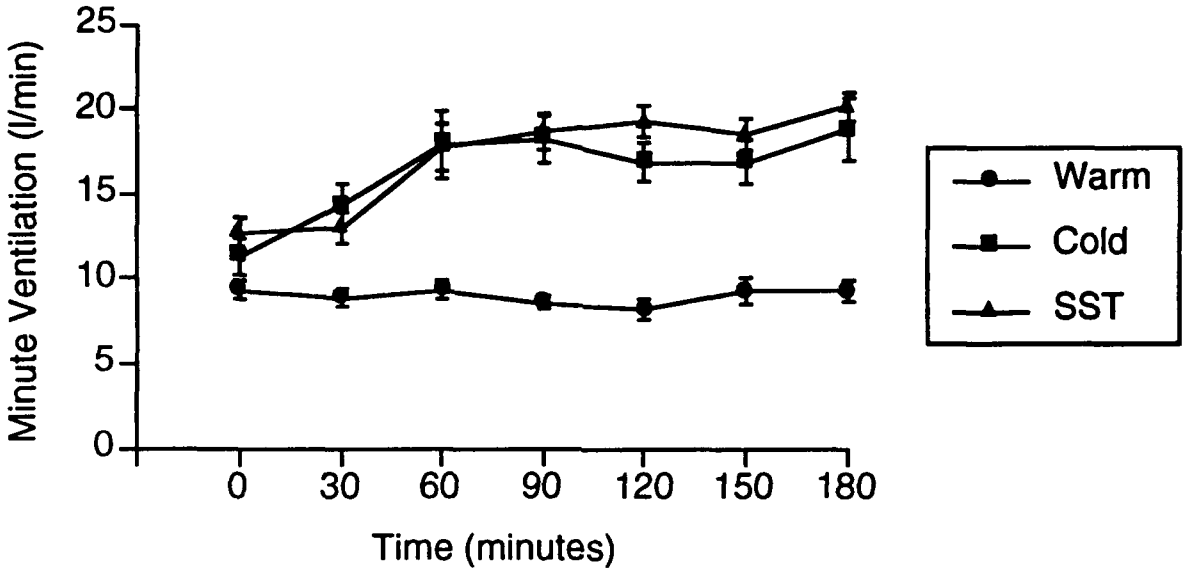
$\dot{V}_E$ = minute ventilation,

$\bar{V}_T$ = mean tidal volume, and

f = the respiratory frequency

Figure 16

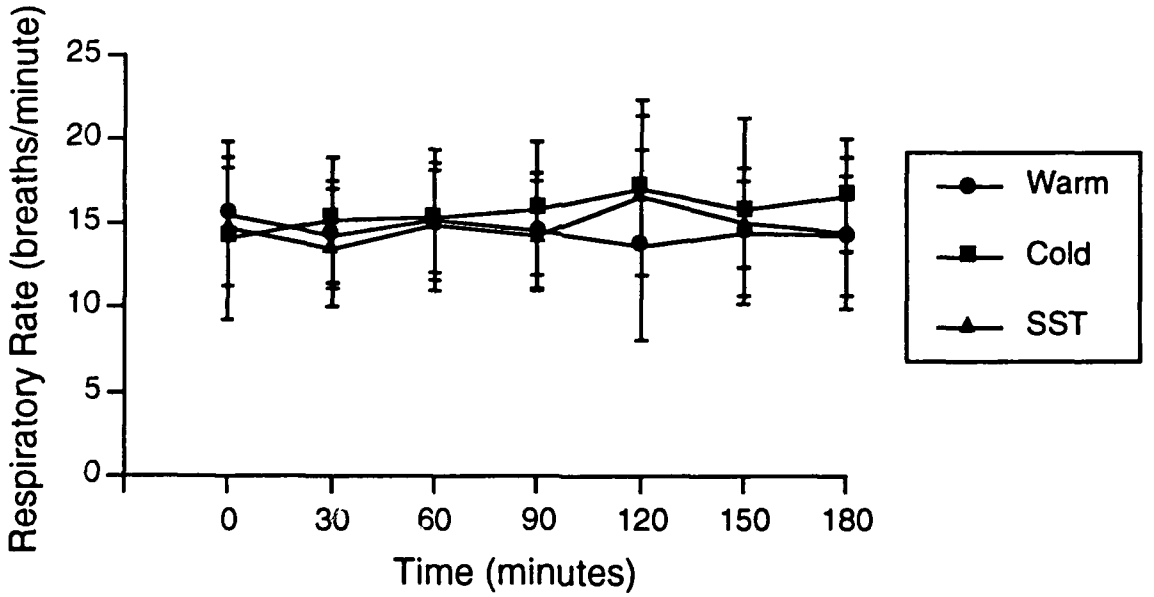
Minute Ventilation



Respiratory rate showed considerable variation between subjects but the mean values were not significantly different between conditions and remained relatively constant over the exposure time (Figure 17). Therefore, the increase in minute ventilation observed during Cold and Shiver Suppression conditions was due to an increase in tidal volume.

Figure 17

Respiratory Rate



The oxygen consumption ($\dot{V}O_2$) and carbon dioxide production ($\dot{V}CO_2$) remained constant in the Warm condition but rose significantly in both Cold and Shiver Suppression exposures (Figure 18 & 19). The rise in oxygen consumption with cold exposure was similar with and without shiver suppression. (Figure 18). A comparable rise in carbon dioxide production occurred with cold stress (Figure 19), however, the addition of shiver suppression resulted in a larger increase in carbon dioxide production (Figure 19).

Figure 18

Oxygen Consumption

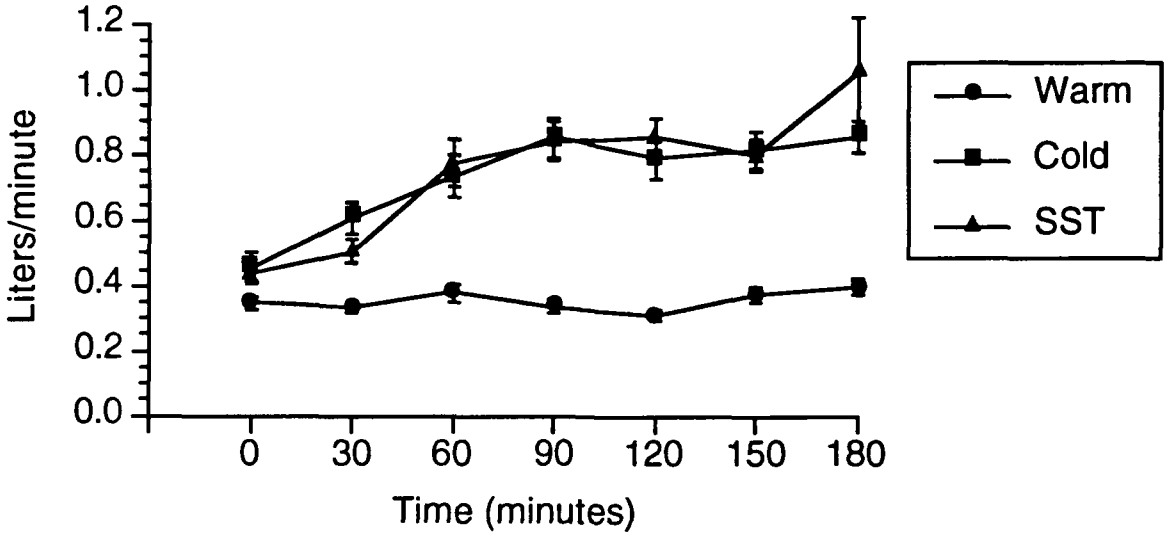
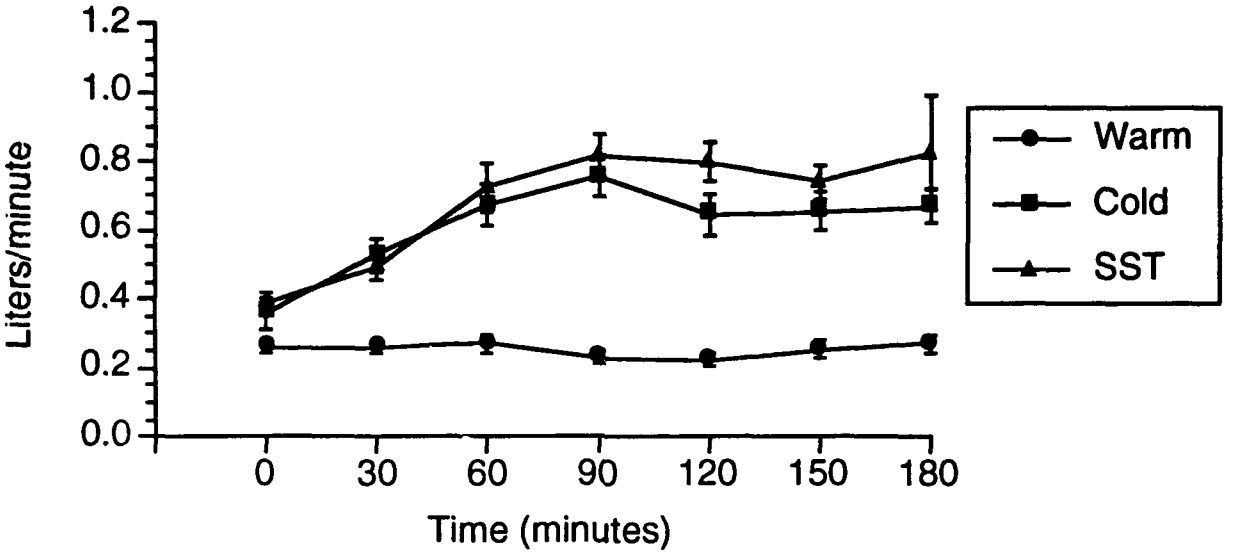


Figure 19

Carbon Dioxide Production



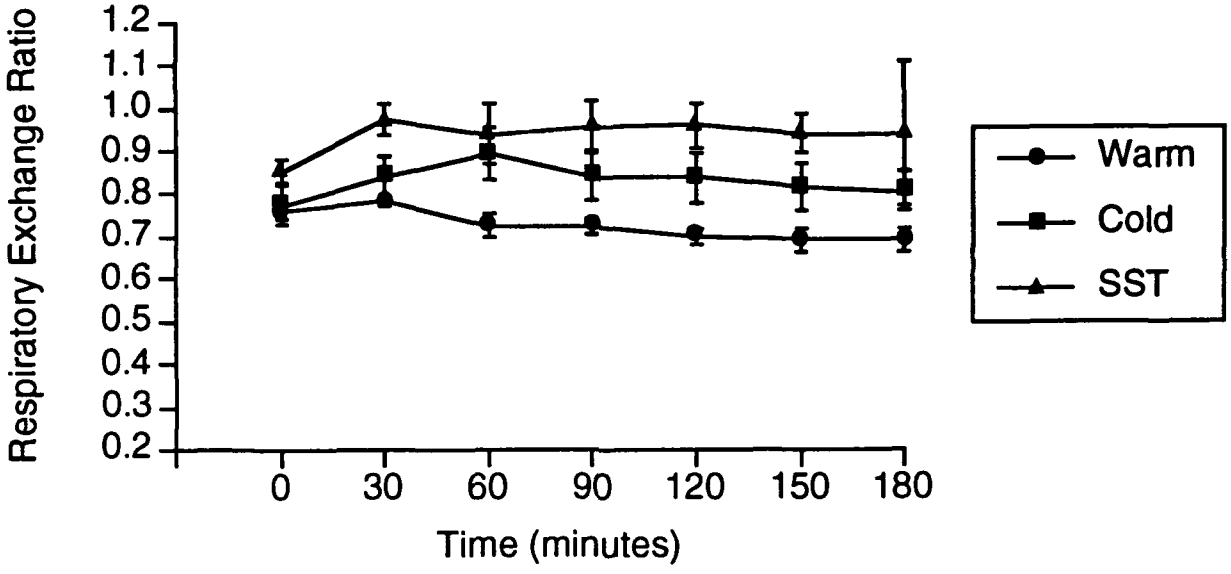
The respiratory exchange ratio (R in Equation 4) remained constant in the Warm condition but rose to a new and relatively constant value in the Cold and Shiver Suppression conditions within the first hour.

$$R = \dot{V}_{CO_2} / \dot{V}_{O_2} \qquad (4)$$

Respiratory exchange ratio in the Shiver Suppression condition was consistently higher than that in Cold condition (Figure 20). This higher value of the respiratory exchange ratio was the result of a greater increase in carbon dioxide production than in oxygen consumption.

Figure 20

Respiratory Exchange Ratio



Motor Performance:

Motor performance was assessed using the time associated with the two reloading maneuvers; rifle, pistol, and the number of shells loaded into magazines (see methods for detailed description). These variables remained constant during the Warm protocol, but showed decrements (demonstrated by an increase in the time measurement of rifle and pistol reloading, and a decrease in the number of shells loaded into magazines) in both cold exposures (Figures 21, 22, & 23).

Figure 21

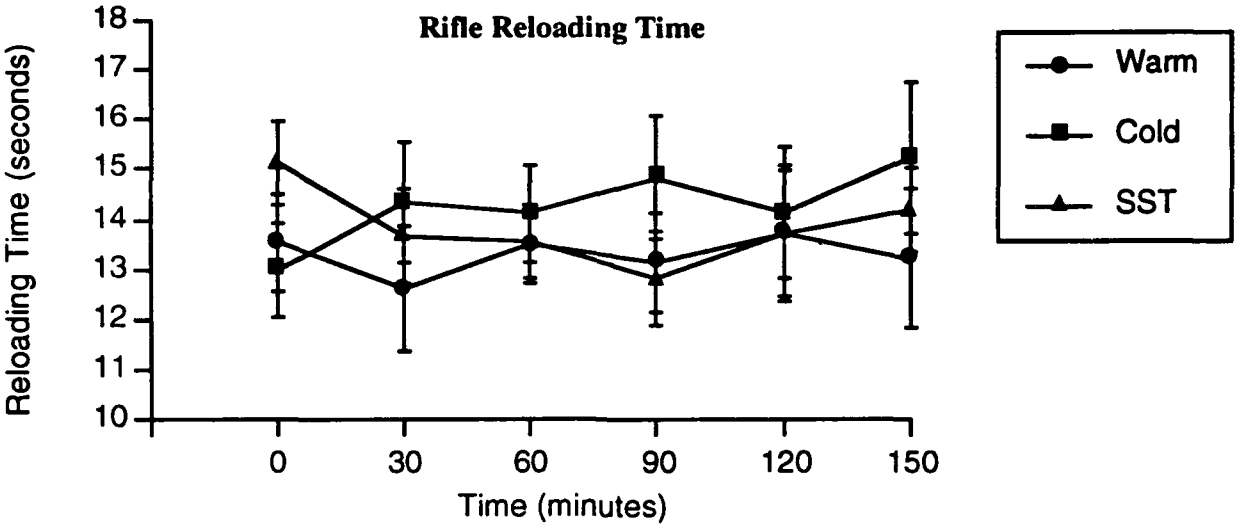


Figure 22

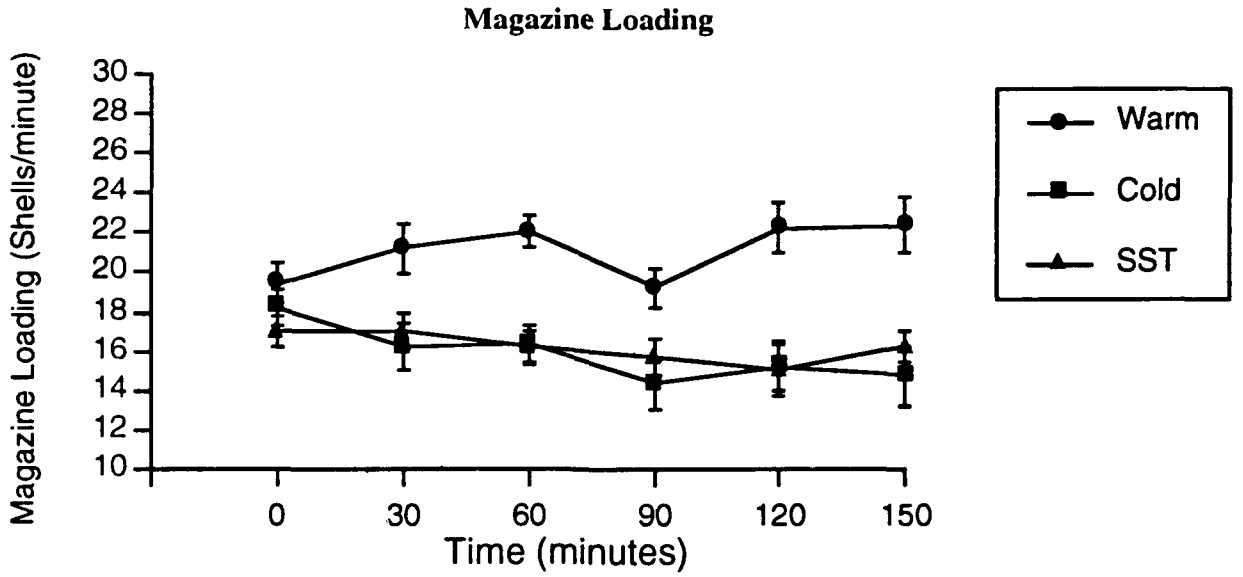
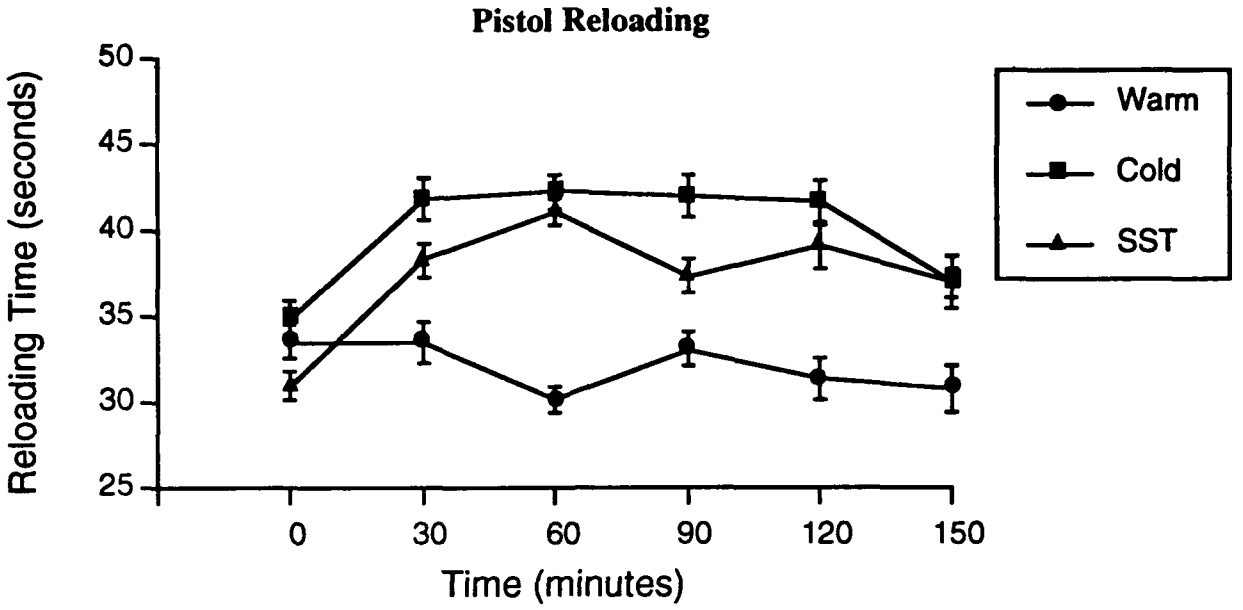


Figure 23

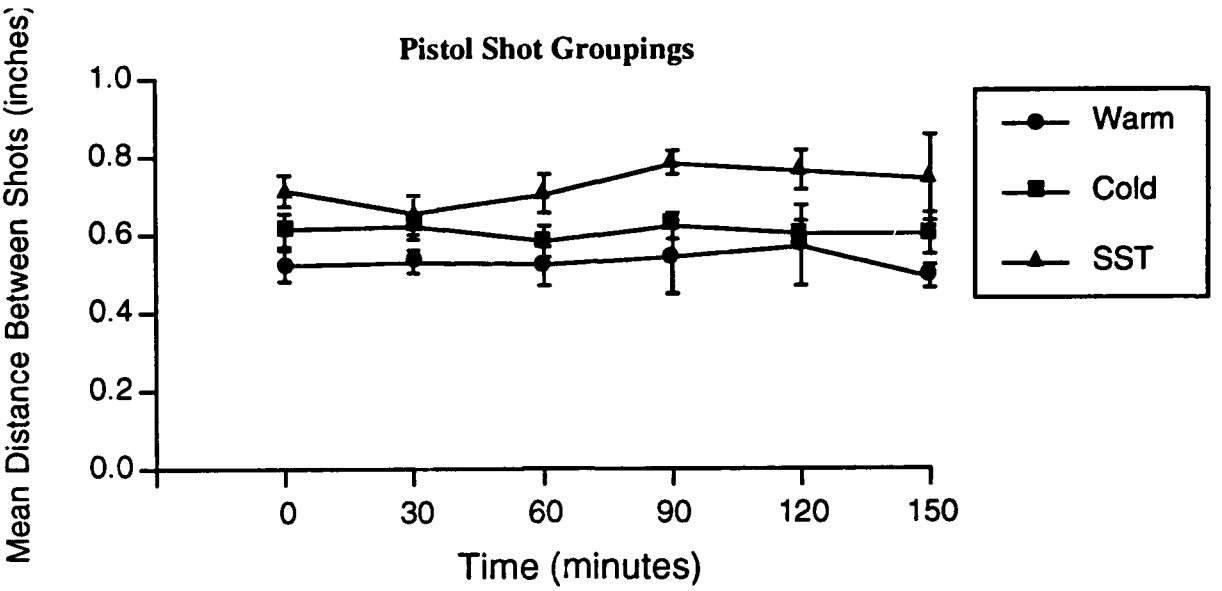


Cold exposure caused the greatest decrements in the fine motor performance tasks of rifle (Figure 21) and pistol reloading (Figure 23). In all but the first and last samples pistol loading was significantly slower during the Cold condition than during the Warm control. This decrement in performance was reduced by the shiver suppression techniques. Rifle reloading times also increased through time during the Cold condition, this difference reaching significance at 90 and 150 minutes into exposure. When shiver suppression techniques were applied, the rifle reloading times were not significantly different from those during the Warm condition and were significantly less than the Cold condition reloading times only at 90 minutes. Magazine loading results for Cold and Shiver Suppression conditions (Figure 22) both showed poorer performance than in the Warm condition, with no difference between the Cold and Shiver Suppression conditions.

Pistol shot groupings (Figure 24) were not significantly effected by cold exposure, although there was a tendency toward poorer performance (larger shot grouping) in both the Cold and Shiver Suppression conditions. Unlike the loading time tasks, a decrement in shooting

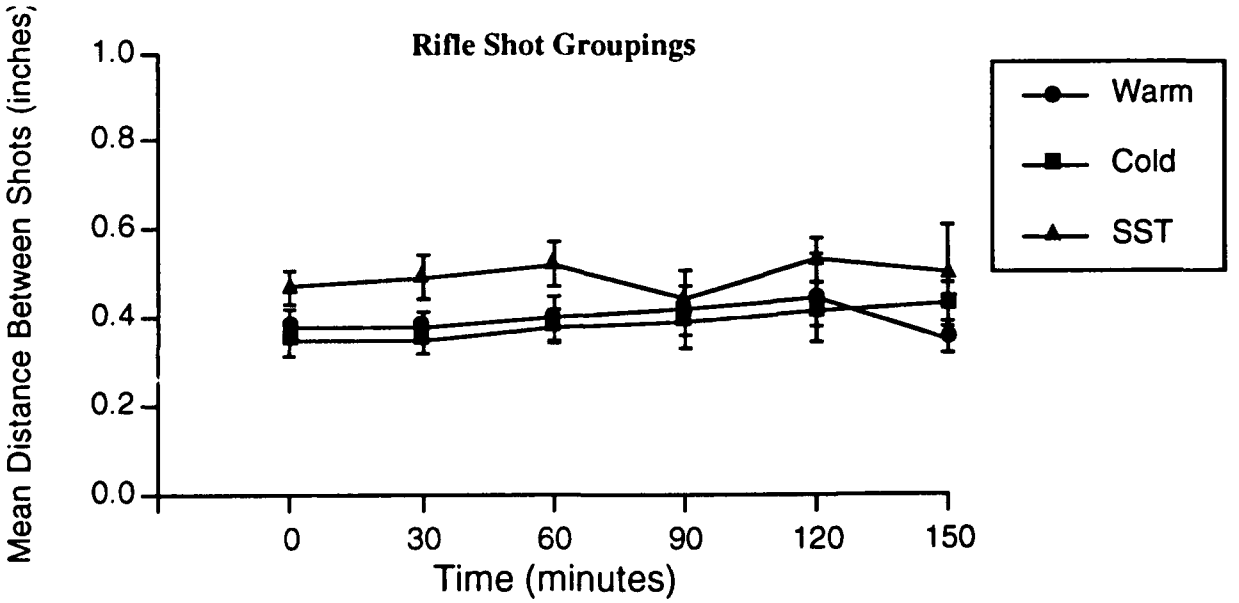
performance was associated with shiver suppression techniques, where shot groupings were significantly larger.

Figure 24



Rifle shot groupings (Figure 25) deteriorated over time in the Cold condition and tended to get worse in the Shiver Suppression condition. Shiver Suppression shot groupings were significantly larger than their corresponding Cold shot groupings at 0 and 120 minutes.

Figure 25



Steadiness of the rifle while shooting was expressed as the RMS voltage of the two accelerometers RMS placed perpendicular to each other on the rifle barrel. Movement in the x direction (Figure 26) represents unsteadiness in the a plane parallel to the floor and movement in the y direction (Figure 27) represents movement in a plane perpendicular to the floor. In the Warm condition, rifle steadiness was constant throughout the test. Cold exposure resulted in a decrease in steadiness by the end of the exposure period, which is more pronounced in the y plane than in the x plane. The implementation of the shiver suppression methods tended to improve steadiness. This was more pronounced in the y plane (Figure 27).

Figure 26

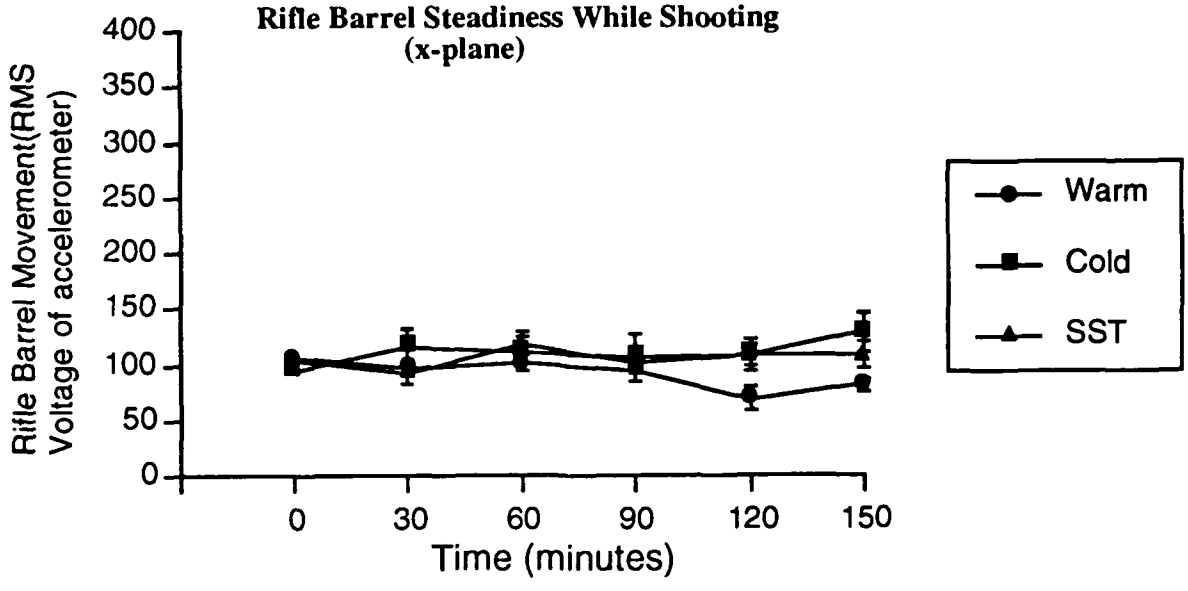
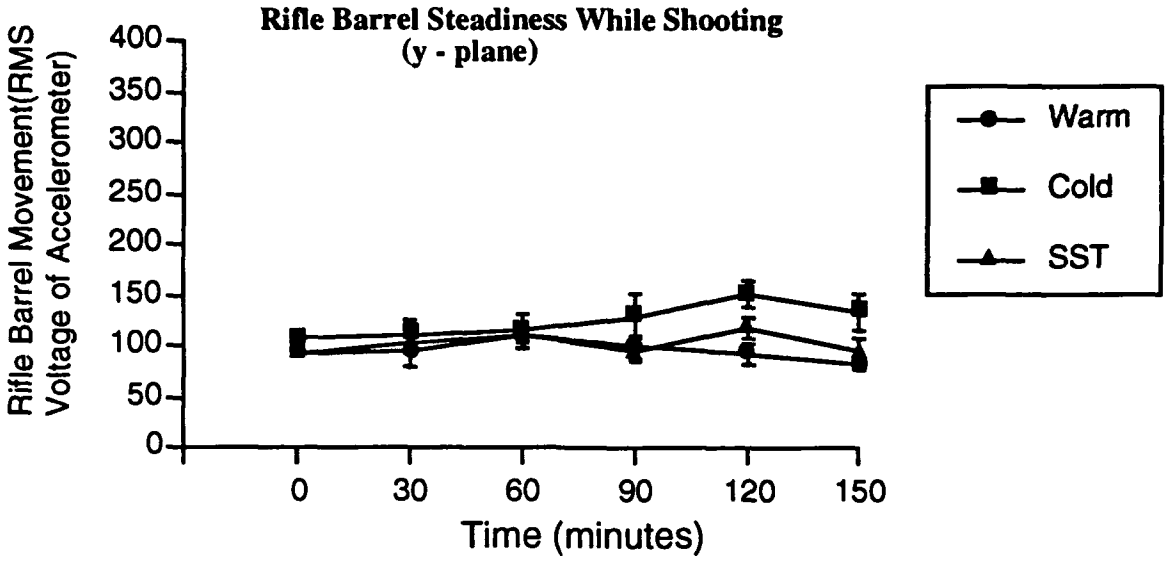


Figure 27



Shivering:

The magnitude of shivering was estimated by calculating RMS voltages of electromyograms (EMGs) from the trapezius & pectoralis major muscles recorded during measurement of metabolic rate (resting period) and during performance tasks. Note that in the Shiver Suppression condition, no shiver suppression techniques were applied during the metabolic rate measurements. EMG activity during metabolic rate measurement increased in both the trapezius and pectoralis muscles with time in the Cold and Shiver Suppression conditions. RMS voltage was significantly greater in the Cold and Shiver Suppression conditions than in the Warm condition while metabolic rate was being measured (see Figures 28a & 28b). EMG activity tended to be higher in the Shiver Suppression condition than in the Cold condition, but this was significant only at the 60 minute sample in the pectoralis major muscle.

Figure 28-a.

EMG Activity of Trapezius Muscle
During Metabolic Rate Measurement

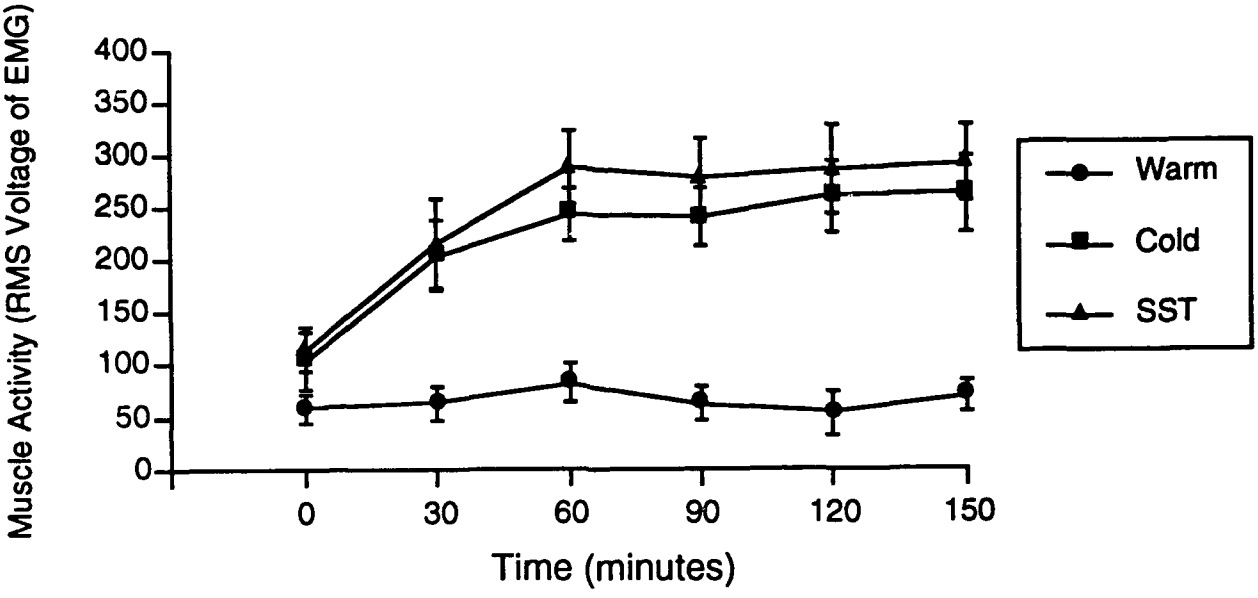
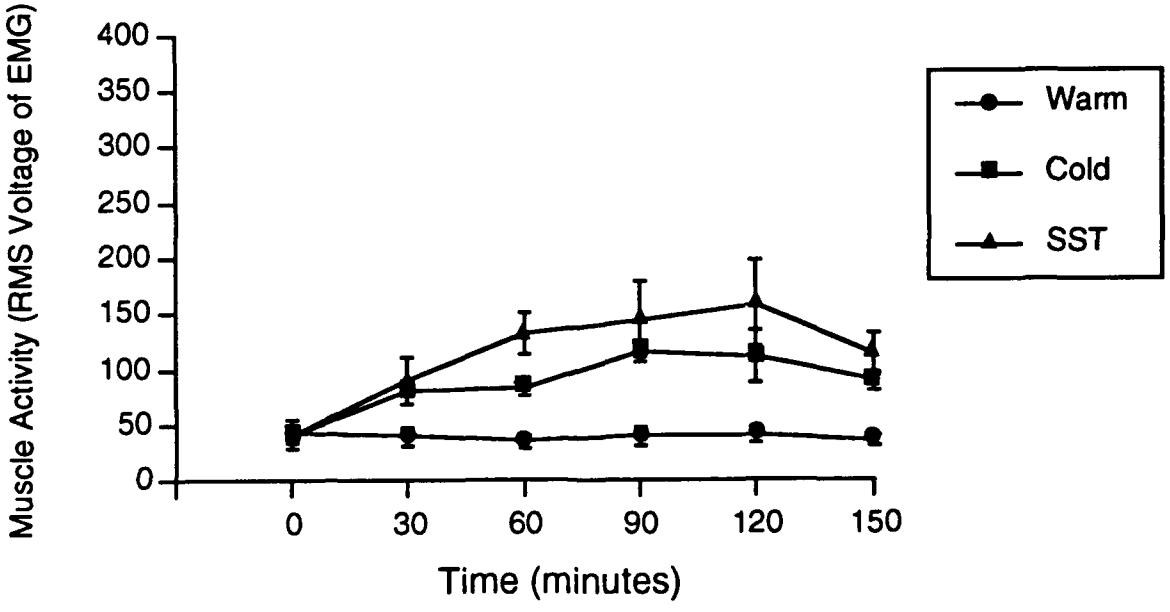


Figure 28-b.

EMG Activity of Pectoralis Major Muscle
During Metabolic Rate Measurement



The EMG activity measured in the trapezius muscle during performance measurements illustrated a different pattern, with the highest activity occurring in the Cold condition, the lowest in the Warm condition and the Shiver Suppression condition falling in between (Figures 29a - 32b). There was only a slight tendency for the muscle activity in the trapezius to increase over time in the Cold and Shiver Suppression conditions during performance tests. Shiver suppression had no effect on EMG RMS values analyzed from the pectoralis during pistol loading (Figure 29a), clip loading (Figure 30b), rifle shooting (Figure 32b), and pistol shooting (Figure 31b) when Cold and Shiver Suppression conditions were compared over time.

Perception of Temperature and Comfort:

Temperature and comfort perceptions followed similar patterns, being relatively unchanged in the Warm condition but dropping by approximately 60 - 75% (Figures 33-a - 35-b) early in the Cold and Shiver Suppression conditions . During the last 90 minutes of the Cold and Shiver Suppression conditions there was relatively little change in perceptions compared to the first 90 minutes. Temperature and comfort perceptions for the toes decreased the most, falling below 10 mm. on the 100 mm. analog scale (see Figure 4-a & b) in the Cold and Shiver Suppression conditions (Figures 34-a & b). Finger (Figures (33a, b) and "Rest of Body" (Figures 35a, b) perceptions remained above 20 mm. Temperature and comfort perceptions for both Cold and Shiver Suppression conditions were significantly lower than in the Warm condition, but temperature and comfort perceptions in the Cold condition were not significantly different from those in the Shiver Suppression condition.

Figure 29-a.

EMG Activity of Trapezius Muscle During Pistol Loading

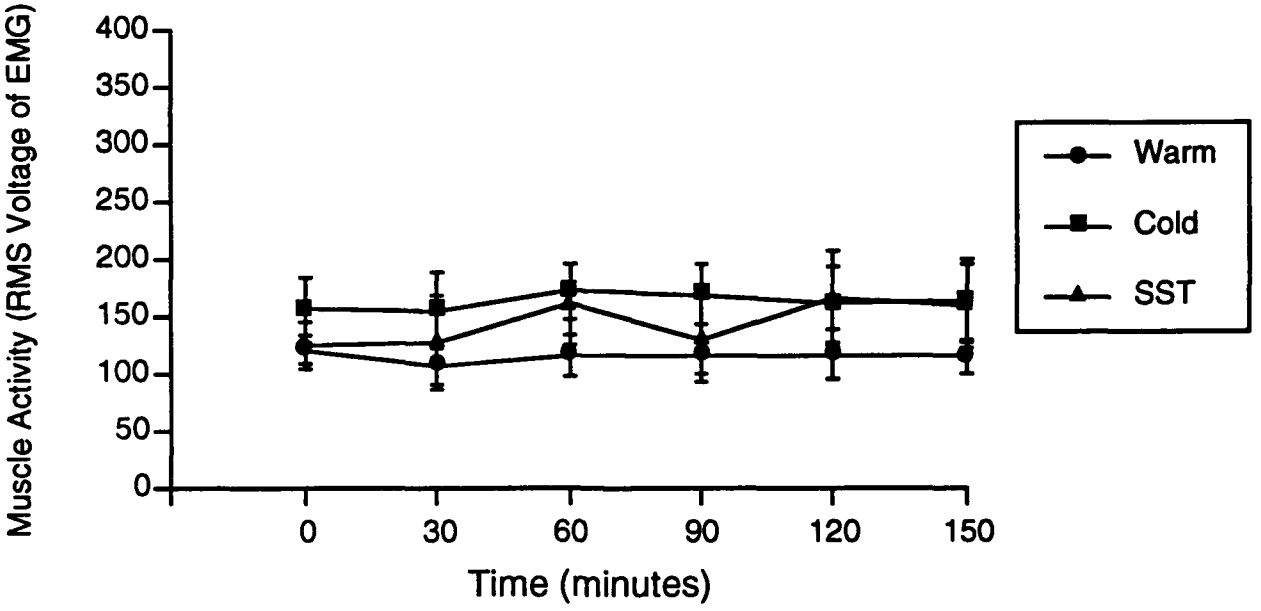


Figure 29-b.

EMG Activity of Pectoralis Major Muscle During Pistol Loading

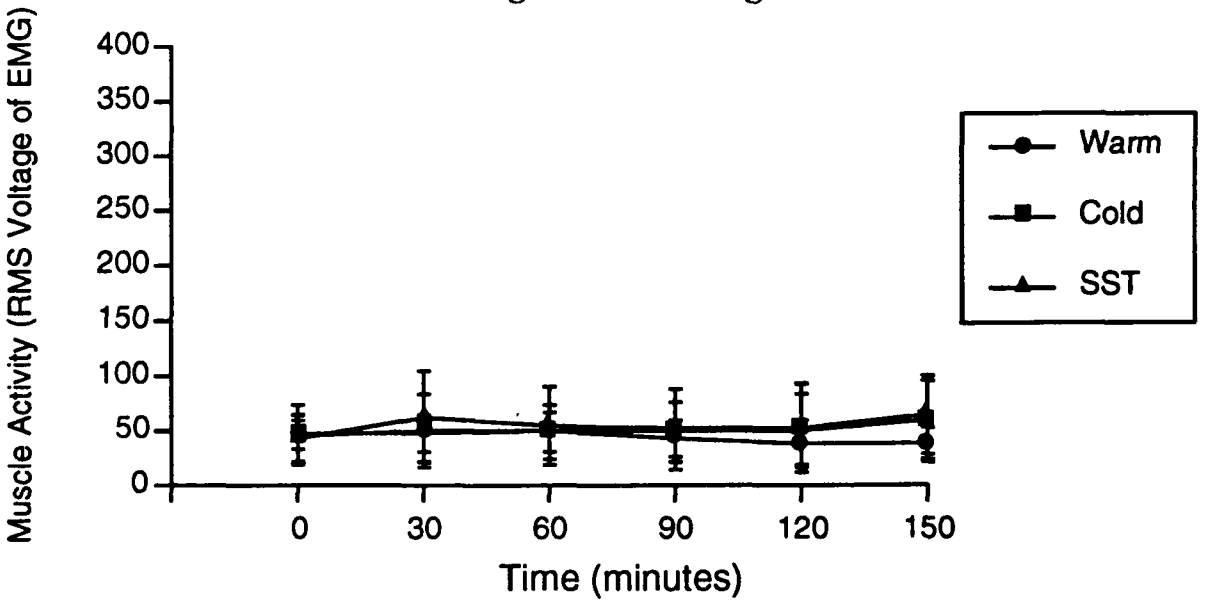


Figure 30-a.

EMG Activity of Trapezius Muscle During Magazine Loading

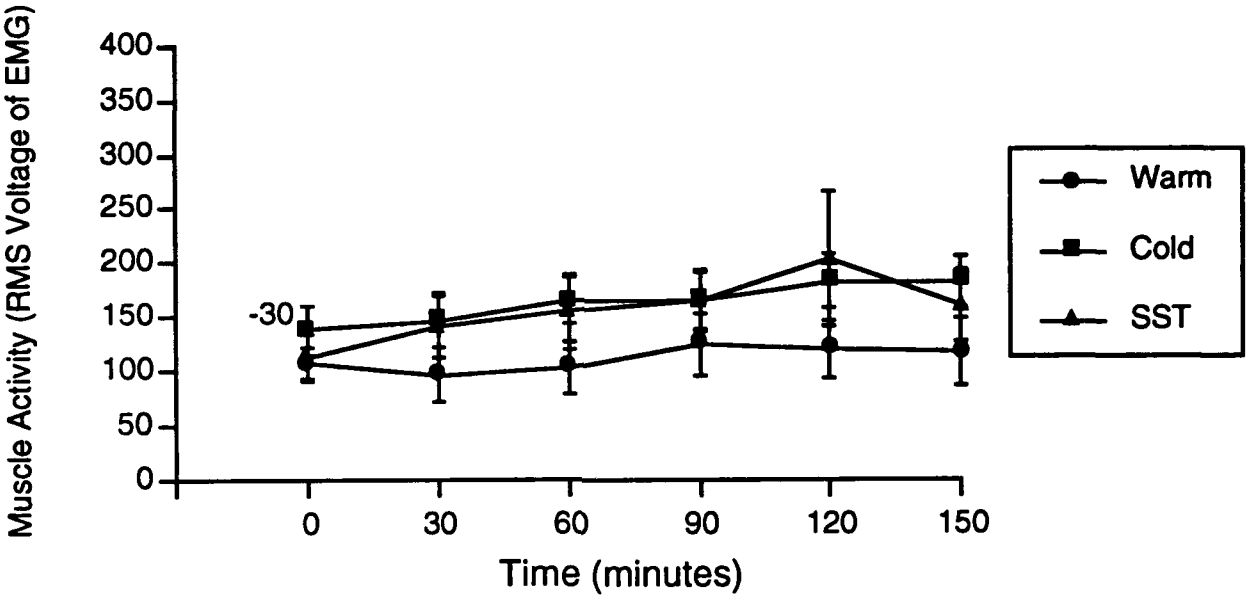


Figure 30-b.

EMG Activity of Pectoralis Major Muscle During Magazine Loading

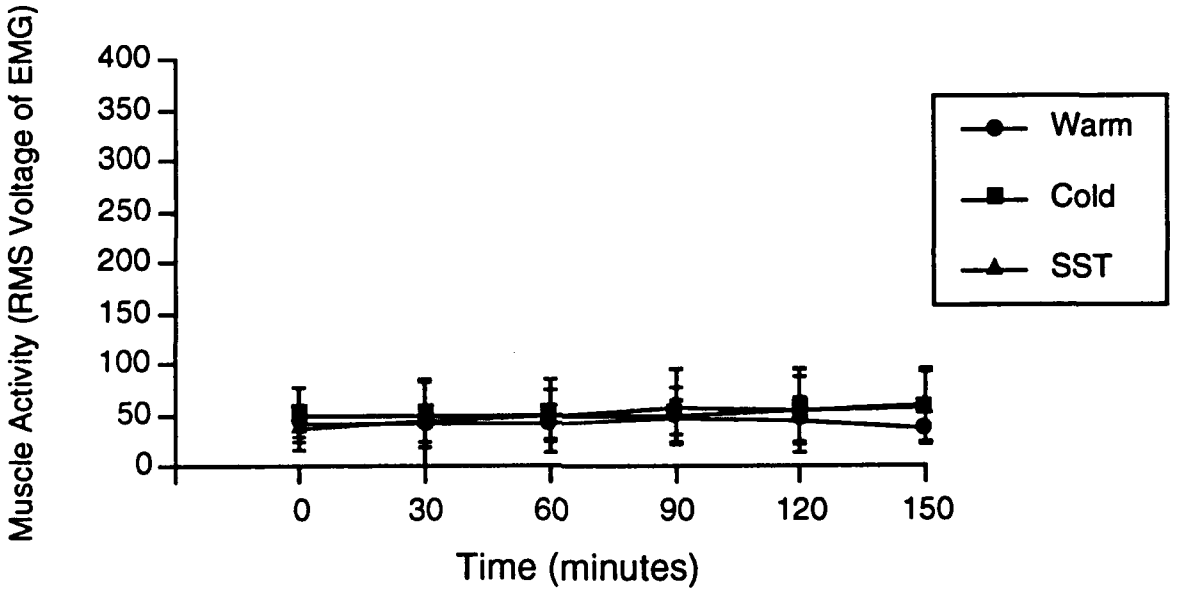


Figure 31-a.

EMG Activity of Trapezius Muscle During Pistol Shooting

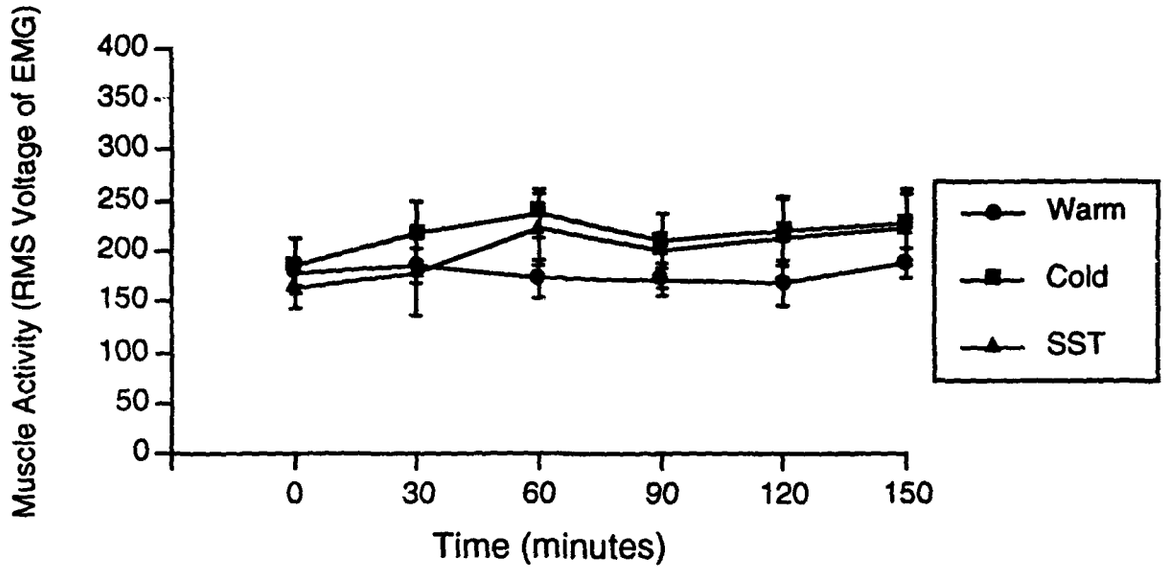


Figure 31-b.

EMG Activity of Pectoralis Major Muscle During Pistol Shooting

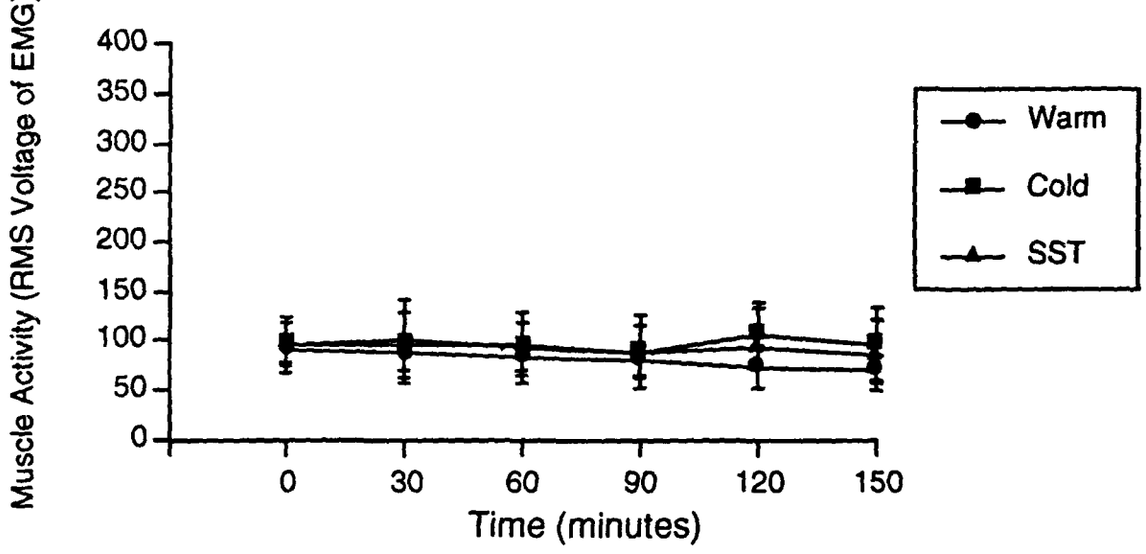


Figure 32-a.

EMG Activity of Trapezius Muscle During Rifle Shooting

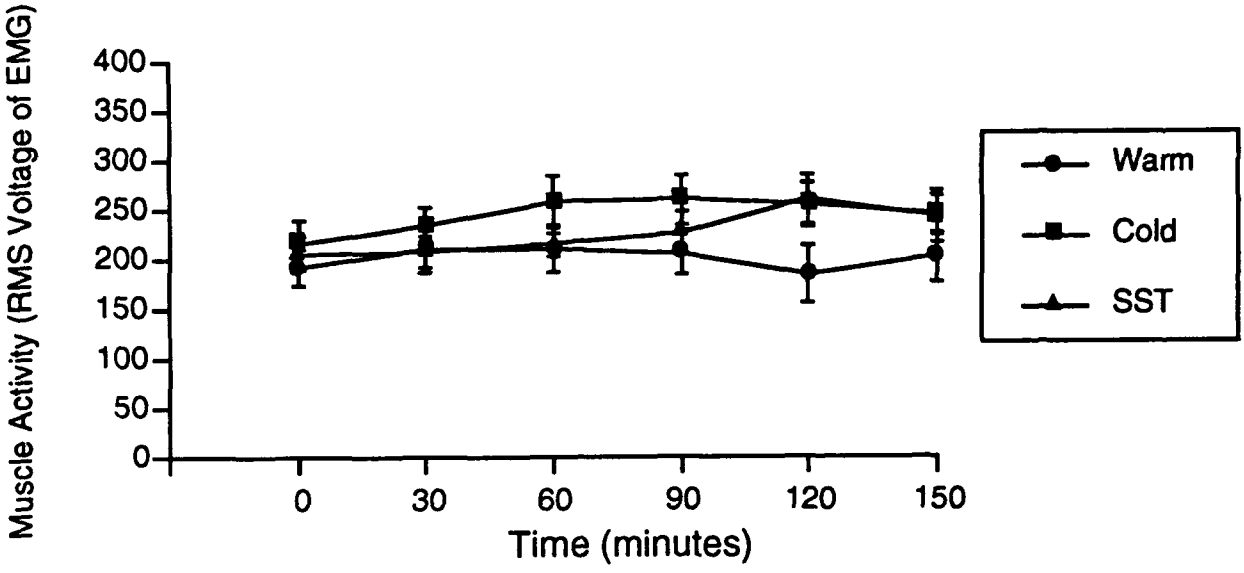


Figure 32-b.

EMG Activity of Pectoralis Major Muscle During Rifle Shooting

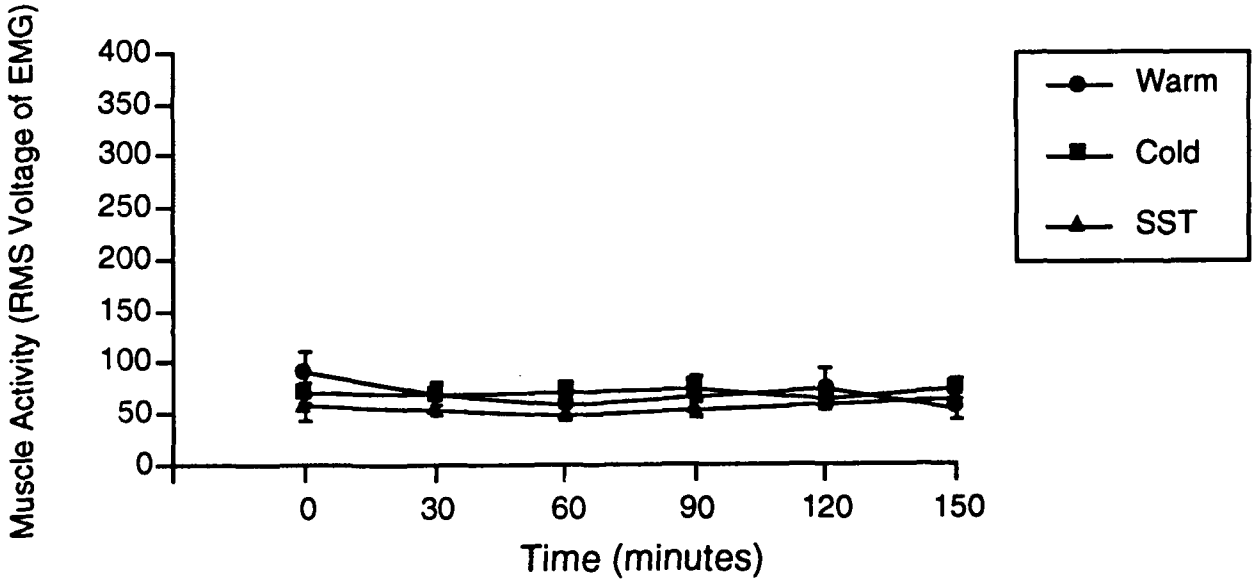


Figure 33-a.

Finger Comfort Perception

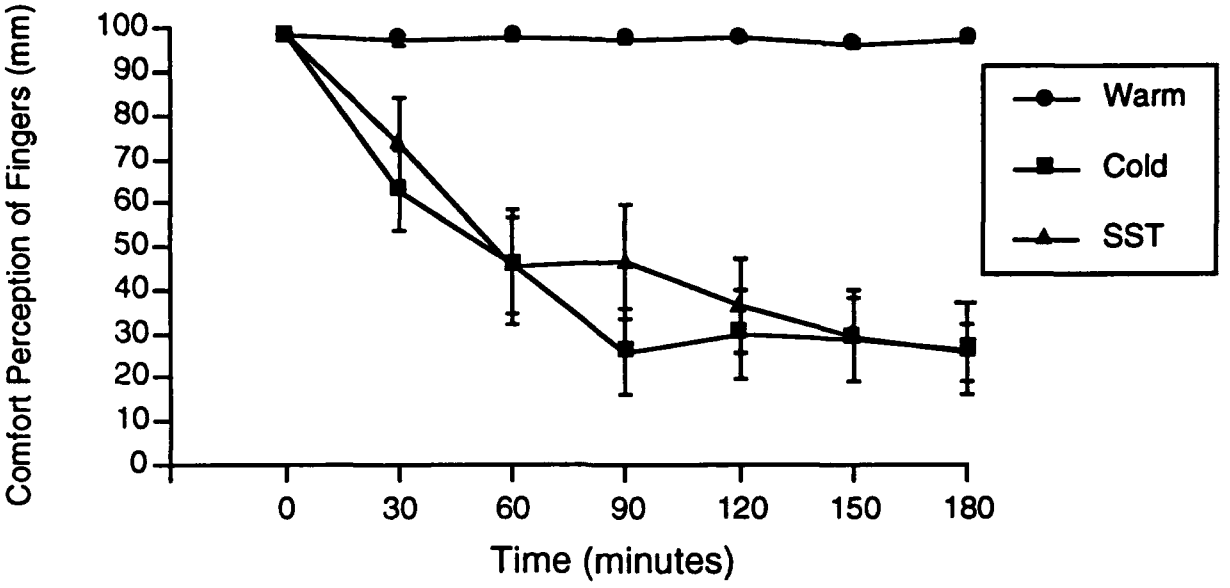


Figure 33-b.

Finger Temperature Perception

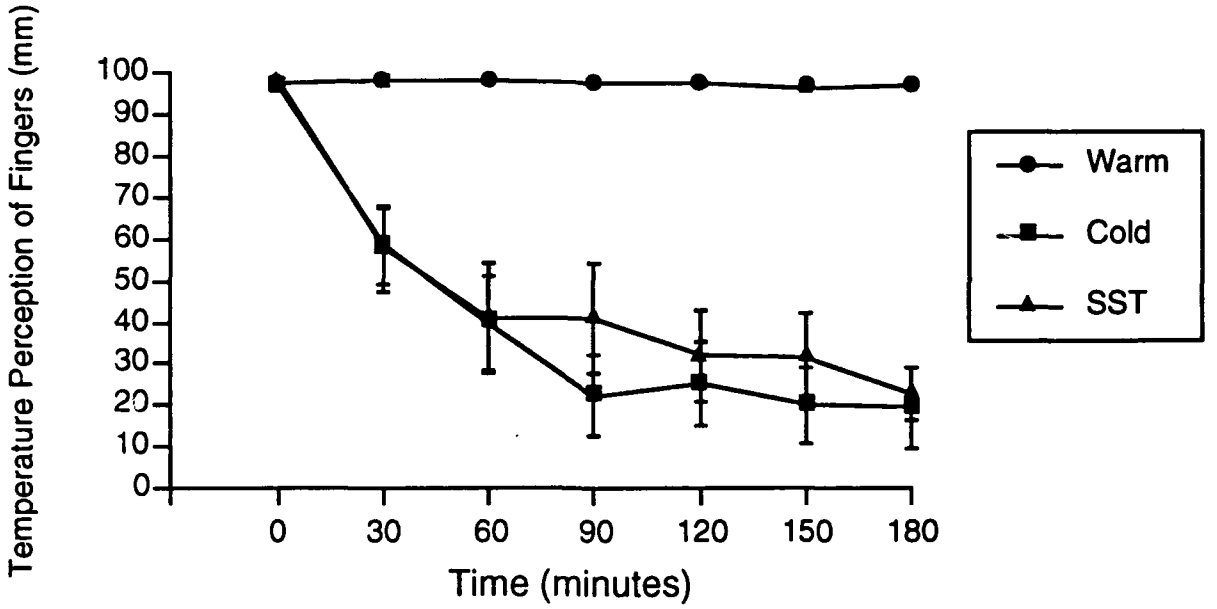


Figure 34-a.

Toes Comfort Perception

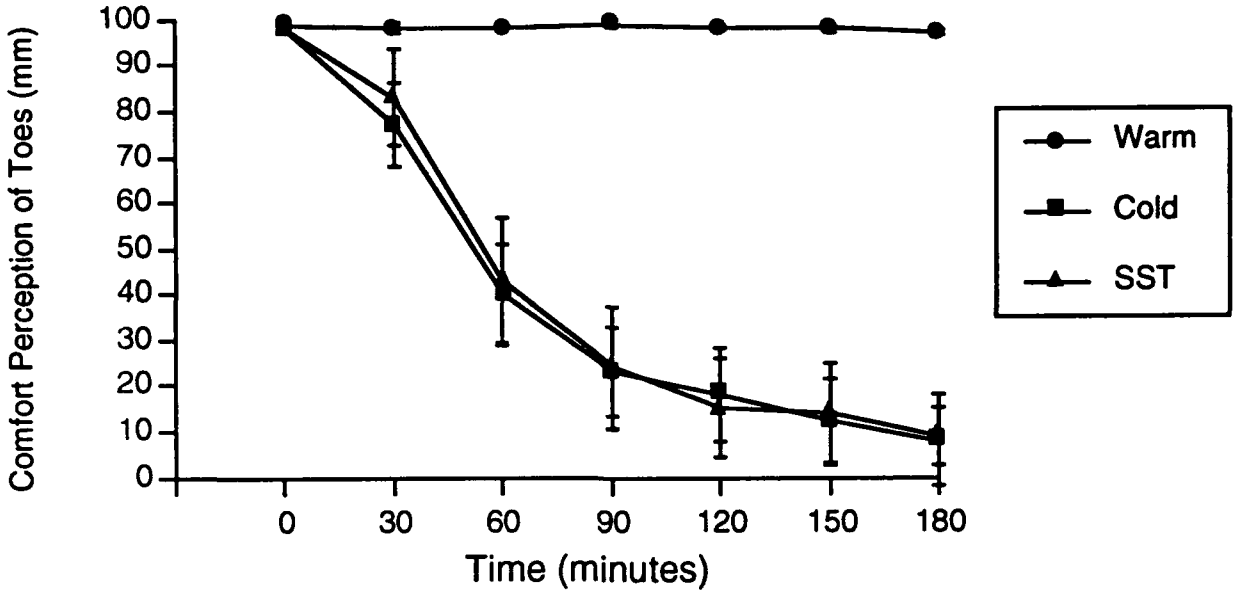


Figure 34-b

Toes Temperature Perception

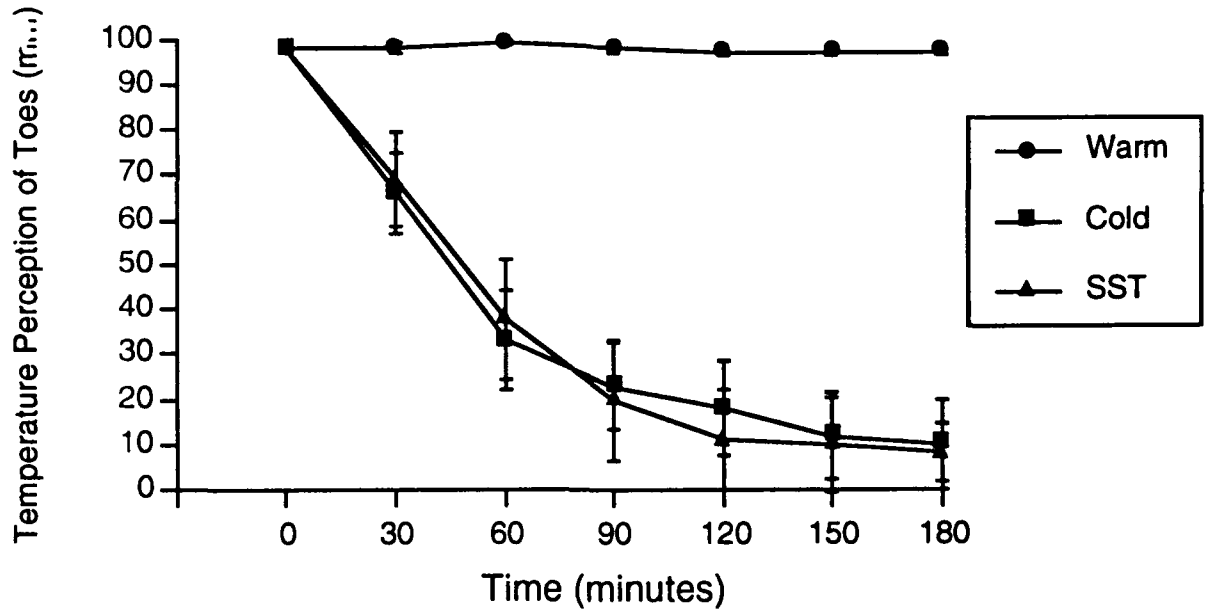


Figure 35-a.

"Rest of Body" Comfort Perception

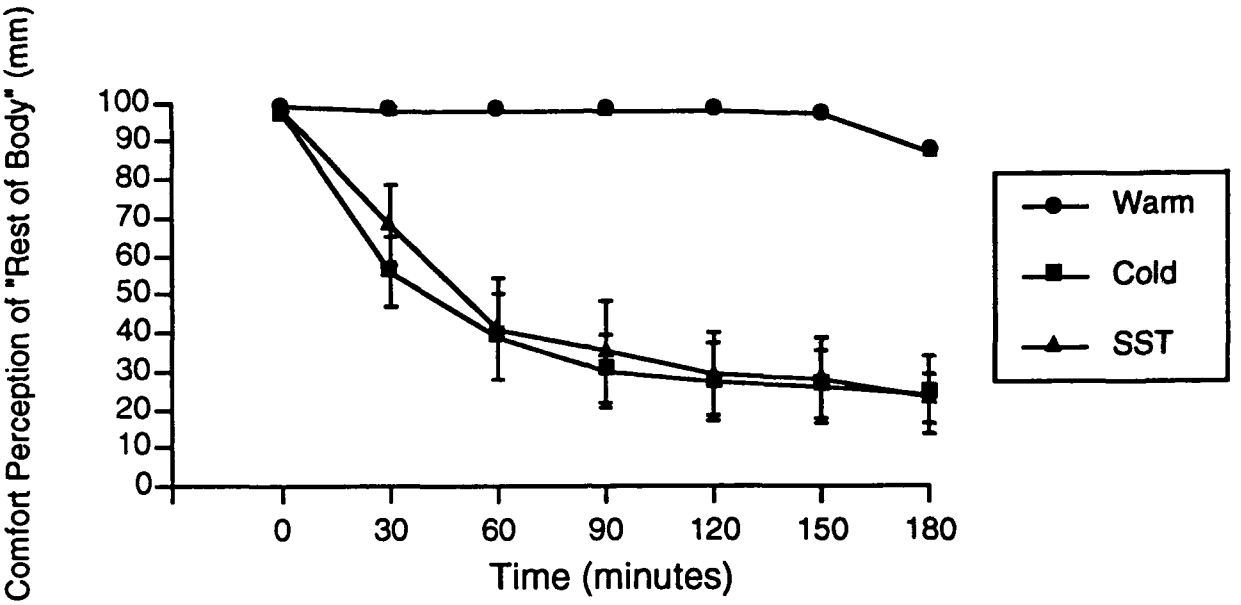
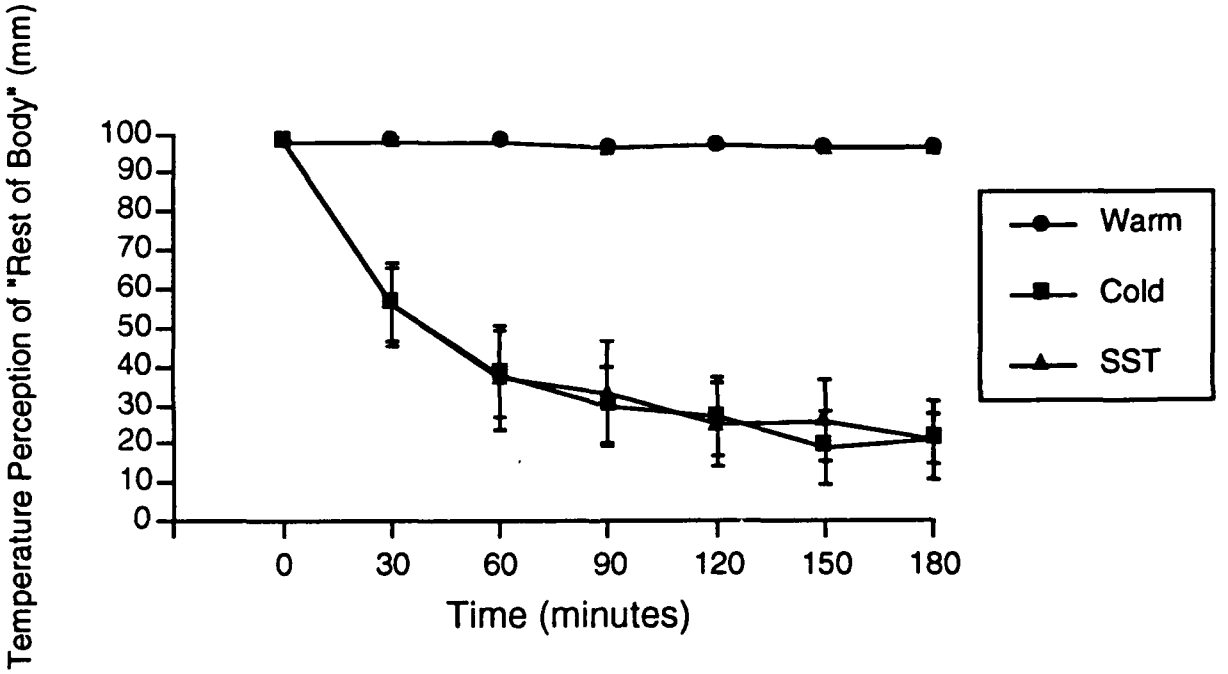


Figure 35-b.

"Rest of Body" Temperature Perception



Discussion

The protocols presented here address the following three major points:

1. How the implementation of shiver suppression techniques affects body heat conservation and temperature regulation under a cold stress situation.

2. How the implementation of shiver suppression techniques affects cardiovascular, respiratory and metabolic function under a cold stress situation.

3. What effect does shiver suppression have on measures of motor performance in the cold.

Of primary importance to this discussion is the possibility that some suppression of shivering takes place whenever voluntary movement is initiated, as suggested by Hemingway et. al, (17). The results of this report contrast with the findings of Phase I of this study, where significant suppression of shivering was noted during breath holding and voluntary relaxation. Though there are trends in the data discussed below which are similar to the findings in Phase I, the degree to which shivering was suppressed was much less during performance of motor speed and accuracy tasks (Phase II) than without these tasks (i.e. suppression techniques alone as in Phase I). The performance of these tasks, which involves voluntary motion and concentration, may have already suppressed shivering to a level at which application of the selected shiver suppression techniques had much less effect. Despite this reduction in the effectiveness of shiver suppression, several significant effects and a number of interesting trends are worth detailing.

Temperature regulation:

Although core temperature fell in all conditions (Figure 5), the addition of shiver suppression to the cold stress resulted in a larger drop in core temperature during the time of exposure. This would indicate that even though the total time of shiver suppression was

relatively small (approximately 12% of the total cold exposure time) a significant depression in heat production and/or an increase in heat loss had occurred. The extent to which these mechanisms are responsible for the greater decline in rectal temperature is unclear, but trends in the data indicate that both may play a role. Shivering tended to be reduced during the Shiver Suppression condition during pistol loading, pistol shooting, and rifle shooting, especially in the earlier portion of the experiment. Shivering increased, however, during the metabolic rate measurements in the Shiver Suppression condition. Apparently a rebound effect was taking place in which subjects' thermoregulatory systems were attempting to compensate for the decreased heat generation during the periods where shiver suppression was applied, by increasing shivering during periods where shiver suppression was not applied. Yet this compensation was obviously inadequate to maintain core temperature.

The decreased core and mean skin temperatures that resulted from suppression of shivering (Figures 5 and 6) undoubtedly resulted in a greater stimulus to the thermoregulatory center to increase the intensity of shivering and other thermoregulatory reactions such as vasoconstriction. However, the results from the different sites of skin temperature measurement varied. For example the toe and face temperatures were slightly higher in the protocol with shiver suppression (Figures 11,12). This indicates a reversal of the expected thermoregulatory vasoconstriction, resulting in greater heat loss from these regions when shiver suppression was implemented. Other investigations have noted changes in blood flow distribution with psychomotor tasks (see Allen et al., 1 for review and references)

The changes in temperature and comfort perceptions closely paralleled those in skin temperature, but gave no indication of the differences in core temperature. When core temperature was decreasing at a greater rate in the Shiver Suppression condition, subjects perceived the same discomfort and skin temperatures as in the Cold condition. The authors have noted similar findings in other studies, namely that temperature and comfort perceptions only accurately reflect skin temperature, and not core temperature (16).

Cardiovascular stress:

Both cold exposures resulted in an expected increase in heart rate (Figure 14) as compared to the Warm (control) condition in which the rate decreased with respect to time. With shiver suppression, the heart rate tended to remain lower than with cold alone, however it did reach the same value by the end of the exposure. Several mechanisms may be postulated to account for this lower heart rate. As with shivering, a rebound effect may have been taking place with heart rate. Heart rates were measured at the same time respiratory gases were collected when subjects were not performing shiver suppression techniques or performance tasks. If heart rates were reflexively increased by concentration on the performance tasks (1), they may have rebounded to a lower than normal level in between performance tasks. In addition, lower rectal temperature in the Shiver Suppression condition would be expected to cause greater peripheral vasoconstriction resulting in central redistribution of blood flow and thus lower heart rates.

There was *no* detectable alteration in systolic or diastolic blood pressure as a function of condition or time.

Respiratory and Metabolic Changes:

Cold exposure resulted in an increase in minute ventilation (Figure 16) which was slightly higher in the Shiver Suppression condition. This slight increase in minute ventilation probably resulted from increased drive to the respiratory center from the increase in CO_2 production. Since the respiratory rate did not change with condition or time, the increase in minute ventilation was the result of an increase in mean tidal volume.

The oxygen consumption and carbon dioxide production increased in both cold exposures (Figures 18 & 19). These changes were slightly higher in the Shiver Suppression condition, with a larger increase in CO_2 production than O_2 consumption, resulting in a higher respiratory exchange ratio (a shift toward 1.0) in this group (Figure 20). It is possible that the increase in metabolic rate in the shiver suppression experiments was an attempt to compensate for the reduction in heat production associated with the suppression of shivering.

The shift in the respiratory exchange ratio toward 1.0 could indicate an increase in carbohydrate metabolism or an increase in anaerobic metabolism, which would produce carbon dioxide without the consumption of oxygen. The increased ventilatory drive resulting from higher CO_2 production would not only result in a higher respiratory rate, but could increase the urgency of subjects to breath during the breath hold shiver suppression technique. Both of these results may have been factors in the poor shooting performance in the Shiver Suppression condition.

Motor Performance:

All reloading procedures employed to monitor motor performance remained relatively constant as a function of time during the Warm (control) protocol. This would indicate that there was no learning effect associated with the repetition of the task. Exposure to cold demonstrated a decrease in motor performance in all reloading tasks as indicated by an increased time in reloading the rifle (Figure 21) and the pistol (Figure 23) and a decreased number of shells successfully loaded in the magazine (Figure 22). This could indicate that the motion associated with shivering is not the primary limiting factor involved with these tasks, but that most of the performance decrement is due to other causes. As noted above, shivering may have already been partially suppressed via concentration on the task at hand. Factors such as numbness of fingers, or distraction caused by overall discomfort are probably involved. By adding another "task" (the specified shiver suppression technique), it is possible that another distraction was interjected into the subjects' thought process, counteracting any advantages to be gained by controlling shivering activity.

Only in the rifle reloading task did shiver suppression significantly reduce the performance decrement caused by cold exposure. In the pistol reloading data there is a strong trend for shiver suppression to improve performance, particularly the relaxation technique at 30 and 90 minutes. These tasks require more motor speed than psychomotor planning and maintenance of steadiness as in the shooting tasks. Here the psychological distraction of the added shiver suppression technique would be less of a factor since these

tasks required less mental concentration. Perhaps shiver suppression techniques should only be applied only to such mentally non-taxing motor speed tasks to improve performance.

Shot groupings were used to evaluate shooting accuracy. Pistol shot groupings were not affected by cold exposure and remained relatively constant with respect to time. The implementation of shiver suppression tended to increase the pistol shot groupings, indicating a decrease in accuracy (Figure 24). Rifle shot groupings increased slightly with respect to time in the cold exposure, and showed deterioration upon implementation of the shiver suppression techniques (Figure 25). This loss of accuracy while using the designated shiver suppression technique could be a result of the distraction associated with consciously attempting to suppress shivering while shooting. Coupled with the maintenance of shooting accuracy during the Cold condition, and the minimal change in rifle barrel movement with cold exposure, this suggests the possibility that motion from shivering is being suppressed by concentration on proper marksmanship techniques.

Shiver Suppression:

As discussed above, the degree of shiver suppression observed in these experiments was considerably less than in the Phase I experiments when it was not superimposed on motor performance tasks. Either shivering was suppressed by the performance of the motor tasks, or subjects were not able to concentrate on the shiver suppression as much and therefore were less effective in suppressing shivering. Despite the marginal decreases in EMG activity in the two muscles monitored, it is evident that shivering was suppressed to some extent since rectal temperatures declined more in the Shiver Suppression condition.

During the majority of the motor performance tasks, shivering activity exhibited no significant differences between the two shiver suppression techniques. Only in the EMG activity of the trapezius muscle during pistol loading (Figure 29-b) was there any evidence that the relaxation technique (applied at 30, 90, and 150 minutes) was more effective than the breath holding technique (applied at 0, 60, and 120 minutes).

Summary

Several previous studies, including Phase I of this project, have reported that shivering can be temporarily inhibited by a number of physical and psychological techniques. Phase II of this study investigated the effect of the two most effective shiver suppression techniques studied in Phase I, on performance of militarily relevant motor performance tasks. It was postulated that if these techniques were applied for short periods of time during performance of motor tasks, performance may be improved during temporary reduction of shivering activity. This approach resulted in marginal improvements only in those motor tasks which involved a minimum of mental concentration and motor planning (rifle and pistol reloading). In tasks which required more attention, no improvements, and some decrements in performance, were noted with addition of shiver suppression techniques.

Several factors were proposed to play a part in these findings: 1) Shivering may have been suppressed by the cognitive activity that accompanied performance of the motor tasks themselves, so that the addition of shiver suppression techniques resulted in little or no additional suppression; 2) the shiver suppression tasks may have distracted subjects during performance of the motor performance tasks; and 3) shiver suppression caused a greater fall in rectal temperature and an increase in carbon dioxide production, which may have decreased subjects' mental and physical abilities. In light of these findings, it follows that although shiver may be voluntarily suppressed to some degree, conscious suppression of shivering should not be applied in an attempt to improve performance of skills which require mental concentration. For simpler, repetitive motor tasks that require little concentration, there may be some benefit from shiver suppression.

These results point to several areas in which further investigations could yield information useful in improving performance during cold exposure. The significant reduction in core temperature when a relatively small amount of shiver suppression (<12% of the total time) was applied was an unexpected finding. When coupled with the probability

that shivering is unconsciously suppressed by many mental and motor tasks, one may conclude that thermoregulation may be impaired by performance of many tasks, because of the reduction in heat production from shivering. In light of this concern, future studies in this area should be designed to determine the thermoregulatory effects of military tasks performed in cold environments. Second, determination of the effectiveness of shiver suppression techniques in other simple, repetitive, motor tasks could prove useful. In addition, determination of which psychomotor tasks suppress shivering the most, and the mechanism of this suppression, would provide the information necessary to effectively suppress shivering in other motor tasks in which shivering is not naturally suppressed. With this information, application of shiver suppression techniques could potentially yield greater and more consistent improvements in performance.

References

1. Allen, MT, Obrist, PA, Sherwood, A and Crowell, MD. Psychophysiology 1987; 24:648-656.
2. Birzis, L and Hemingway, A. Journal of Neurophysiology 1957; 20:156-166.
3. Birzis, L and Hemingway, A. J . Neurophysiol. 1957; 20:91-99.
4. Brown, DD, Gaylor, JB and Uprus, V. Brain 1935; 58:233-237.
5. Bullard, RW. Life Sciences 1964; 3:395-405.
6. Burton, AC and Bronk, DW. American Journal of Physiology 1937; 119:284.
7. Corte, JH and McCance, RA. Journal of Physiology 1953; 120:115-121.
8. D'Anna, L. Experimentia 1967; 23:638-639.
9. Gautier, H, Bonora, M, Schultz, SA and Remmers, JE. Journal of Applied Physiology 1987; 62:2477-2484.
10. Girling, F and Topliff, EDL. Canadian Journal of Physiology and Pharmacology 1966; 44:495-499.
11. Glaser, EM and Jones, RVH. Journal of Physiology 1951; 114:277-282.
12. Gleeson, M, Barnas, GM and Rautenberg, W. Pflugers Archives 1986; 407:312-319.
13. Glickman, N, H. H. Mitchell, R. W. Keeton, E. H. Lambert. J. Appl. Physiol. 1967; 22:1-8.
14. Hemingway, A. Physiological Review 1963; 43:397-422.
15. Ishii, K and Ishii, K. Tohoku Journal of Experimental Medicine 1960; 72:229-236.
16. Israel, DJ, Hoffman, RG and Wittmers, LE. Reaction Times and Evoked Potentials During Moderate Internal and External Cooling. 176 (American Physiological Society, Colorado Springs, Colorado, 1992)
17. Kleinbeckel, D, and F. W. Klussmann. *Shivering in Thermoregulation.* 235-253 (Pergamon Press, New York, 1989).
18. Klenow, C, F. Simmons, and R. Pozos. Decrease in shivering by mental computation. (New Orleans, LA, 1987)

19. Kosaka, M and Simon, E. Pflugers Archives 1968; 302:357-373.

20. Kosaka, M, Takagi, K and Nakayama, T. Nagoya Medical Journal 1975; 20:167-176.

21. Lupandin, YU. Sechenov Physiological J. USSR 1979; 65:1661-1670.

22. Martin, S and Cooper, KE. Pflugers Archives 1981; 391:81-83.

23. Mott, JC. Journal of Physiology 1963; 166:563-586.

24. Simon, E, K. Pierau, and D. C. Taylor. Physiologyical Reviews 1986; 66:235-300.

25. Simon, E. NIPS 1987; 2:89-93.

26. Simon, E, Klussmann, FW, Rautenberg, W and Kosaka, M. Pflugers Archives 1966; 291:187-204.

27. Stuart, DG, E. Eldred, A. Hemingway, and Y. Kawamura. in *Temperature: Its Measurement and Control in Science and Industry* (eds. J. D. Hardy) 545-547 (Reinhold Publishing Corporation, London, 1963).

28. Uprus, V, Gaylor, GB and Carmichael, EA. Brain 1935; 58:220-232.

Publications and Presentations Resulting From this Project

Suppression of shivering by breath holding, relaxation, mental arithmetic, and warm water ingestion. DJ Israel, LE Wittmers, RG Hoffman, and RS Pozos. Aviation, Space, and Environmental Medicine. In press.

The effect of shiver suppression on core temperature in cold stressed man. LE Wittmers, RG Hoffman, and D Israel. Paper presented at the 76th Annual Meeting of the Federation of American Societies for Experimental Biology, April 9, 1992, Anaheim, CA.

Temperature perception, motor skills, and voluntary suppression of shivering during cold stress. CJ Gebeck, LE Wittmers Jr, DJ Israel, and RG Hoffman. Paper presented at the NIH-MBRS-MARC Symposium, October 11-13, 1990, Nashville, Tennessee.

Voluntary suppression of cold air induced shiver in humans. LE Wittmers, Jr., RG Hoffman, and D Israel. Paper presented at the 74th Annual Meeting of the Federation of American Societies for Experimental Biology, April 4, 1990, Washington, D.C.

The role of light exercise on the onset and intensity of shivering in cold exposed humans. Wittmers, L., Israel, D., and Hoffman, R. Paper presented at the 41st Annual Fall Meeting of the American Physiological Society, October 6-10, 1990, Orland, Florida

Thermal sensation and motor skills following prolonged cold stress. RG Hoffman and LE Wittmers, Jr. Paper presented at the 74th Annual Meeting of the Federation of American Societies for Experimental Biology, April 4, 1990, Washington, D.C.

Evaluation of Physiological and Psychological Impairment of Human Performance in Cold Stressed Subjects

Contract No. DAMD17-88-C-8054

Personnel List

Robert S. Pozos, Ph.D., original Principal Investigator, changed to Consultant

Lorentz E. Wittmers, Jr., M.D., Ph.D., Principal Investigator

Richard Hoffman, Ph.D., Co-Principal Investigator

Bradley Ingersoll, Junior Applications Programmer

Robert Dromeshauser, Principal Laboratory Technician

Postmark Deadline: May 15, 1990 (MBRS)
August 15, 1990 (MARC)

Address Proposals to:
NIH - MBRS - MARC SYMPOSIUM PROGRAM
c/o Dr. Herbert Silber
Department of Chemistry
San Jose State University
San Jose, CA 95192-0189
(408) 924-4954

1990 NIH - MBRS - MARC SYMPOSIUM
ABSTRACT FORM

(Read all of the instructions carefully before preparing your abstract)

TEMPERATURE PERCEPTION, MOTOR SKILLS, AND VOLUNTARY SUPPRESSION OF SHIVERING DURING COLD STRESS. C.J. Gebeck*, L.E. Wittmers,Jr., D.J. Israel, R.G. Hoffman. Hypothermia and Water Safety Laboratory, University of Minnesota-Duluth School of Medicine, Duluth, MN 55812

Shivering is an increase in uncoordinated muscular activity during cold exposure. To investigate the correlation of human temperature perception with body temperature measurements, degradation in motor performance from shivering, and voluntary suppression of shivering, 13 lightly clothed subjects were exposed to 0° C air for 2.5 hours. Rectal and mean skin temperatures were continuously recorded. Perceptions of body temperature and comfort were assessed at 30 minute intervals using visual analog scales. Performance on Grooved Peg Board Test, O'Connor Tweezer Dexterity Test, and hand dynamometer were measured before and at the end of exposure. To evaluate voluntary suppression of shivering, subjects were asked to a) hold a breath for 30 seconds, b) drink 8 oz.warm (120°F) water, c) perform mental calculations, d) or simply relax their muscles as much as possible. Test order was counterbalanced across subjects, and shivering was allowed to return to baseline intensity between trials. Mean RMS values for electromyograms of 7 shivering muscles were compared before and during performance of the above tasks to assess the degree of shivering suppression. Perceived comfort and perceived body temperature decreased 79.3% and 81.2% respectively, and were not significantly correlated with skin or rectal temperature changes. Decreases in performance were 44.6% on the Grooved Peg Board, in 17.1% on O'Connor Tweezer Dexterity Test, and 9.1% in grip strength, Shivering was suppressed 11.25% after drinking warm water, 18.7% while performing mental calculations, 21.48% when holding a breath, and 26.92% during voluntary muscle relaxation. The results suggest that temperature perception and comfort perception following 2.5 hours of cold air exposure are not a function of either surface or core temperatures, nor are they directly related to changes in motor skills. EMG data suggests that shivering may be suppressed for short periods of time by voluntary activities, presumably cortical in origin. (Supported by U.S. Army Medical Research Support Grant #DAMD 17-88-C-8054 and U.S. Naval Medical Research Command Grant #N00014-88-K-0582). Lorentz E. Wittmers, Jr.

Opinions, interpretations, conclusions and recommendations are those of the author and are not necessarily endorsed by the U.S. Army or the U.S. Navy.

Type in the following information.

Full Name of First Author Christopher J. Gebeck

First Author's Address Department of Physiology, UMD School of Medicine,
10 University Drive

City Duluth State MN Zip 55812

Topic Number & Label IV. C. Neurophysiology Preferences: Oral X Poster ___ Either ___

Each abstract form must be read and signed by both the Faculty Sponsor and the Program Director. Your signatures certify that this is an error-free abstract.

Faculty Sponsor L.E. Wittmers Jr. (Signature) 5-22-90 (Date) (218) 726-7934 (Phone)

Program Sponsor Sherrill Petite (Signature) 5-22-90 (Date) (218) 726-8876 (Phone)

Symposium Dates:
October 11-13, 1990
Stouffer Hotel - Nashville, TN

For Program Committee Use Only
Abstract # ___
Date ___ Time ___ Am ___

BPI/4-90/NIH-89/ABSTRACT

THE FASEB JOURNAL

Federation of American Societies for Experimental Biology
74th Annual Meeting Washington, D.C.
April 1–5, 1990

4061

THERMAL SENSATION AND MOTOR SKILLS FOLLOWING PROLONGED COLD STRESS R.R. Hoffman* and L.F. Wittmers, Jr. Hypothermia and Water Safety Laboratory, University of Minnesota-Duluth School of Medicine, Duluth, MN 55812

Perceived thermal intensity and thermal comfort in response to cold stress are thought to be a function of signals from peripheral thermal receptors as well as central thermal receptors. To investigate the relative contribution to thermal sensation of peripheral versus central cold stimuli during prolonged cold air exposure, 16 lightly dressed human subjects were exposed to 0° C air for three hours and their perceptions of body temperature and comfort were assessed at 30 minute intervals using visual analogue scales. Rectal temperatures were continuously monitored as were surface temperatures at the medial chest, upper arm, thigh and leg. Performances on the Grooved Pegboard, Connor Tweezer Dexterity Test and Hand Dynamometer were taken pre- and post-exposure to assess motor speed, strength and dexterity. Perceived comfort decreased in a linear fashion an average of 79.3% over the course of the exposure time and perceived body temperature decreased linearly an average of 81.2% and were not significantly correlated with either surface temperatures or rectal temperatures, nor were they correlated with the observed average decreases of 44.6% in motor speed, 9.1% in grip strength or 17.1% in motor dexterity. The results suggest that thermal sensation and cold perception following prolonged cold air exposure are not reliably a function of either surface or core temperatures, nor are they directly related to changes in motor output skills. (Supported in part by U.S. Naval Medical Research Command Grant #N00014-88-K-0582).

Opinions, interpretations, conclusions and recommendations are those of the author and are not necessarily endorsed by the U.S. Army or the U.S. Navy.

In the conduct of research where humans are the subjects, the investigators adhered to the policies regarding the protection of human subjects as prescribed by 45 CFR 46 (Protection of Human Subjects).

THE FASEB JOURNAL

Federation of American Societies for Experimental Biology
74th Annual Meeting Washington, D.C.
April 1–5, 1990

VOLUNTARY SUPPRESSION OF COLD AIR-INDUCED SHIVER IN HUMANS.
L.E. Wittmers, Jr., R.G. Hoffman* and D. Israel* Hypothermia and Water Safety Laboratory, University of Minnesota-Duluth School of Medicine, Duluth, MN 55812

Shivering in response to cold stress is a synchronous contraction of flexor and extensor muscles that may have both central and peripheral components. To investigate a possible higher cortical component in shiver modulation, 13 lightly dressed human subjects were exposed to 0° C air for 2 hours until a reliable pattern of shiver was observed at EMG sites on the trapezius, pectoralis major, biceps, triceps, quadriceps, hamstrings and soleus. Surface EMGs were continuously monitored as subjects, while standing, were asked to perform one of the following: hold their breath for 10 seconds, drink 8 oz of warm (120° F) water, perform mental arithmetic calculations or simply relax their muscles as much as possible. Each of these was done in a counterbalanced order across subjects, and sufficient time elapsed between trials to allow the shiver response to return to baseline intensity. Analysis of the EMG frequency distributions revealed an average attenuation or suppression of shiver RMS amplitude for all muscle sites combined of 11.25% after consuming warm water, 18.7% while performing mental arithmetic, 21.48% when holding a breath and 26.92% during whole body muscle relaxation. These data lend support to the notion that there may be a secondary modulating effect of shiver at the level of the cerebral cortex and suggests that shiver may be suppressed for short periods of time by voluntary activities, presumably cortical in origin.
(Supported in part by U.S. Army Medical Research Support Grant #DAMD 17-88-C-8054).

Opinions, interpretations, conclusions and recommendations are those of the author and are not necessarily endorsed by the U.S. Army or the U.S. Navy.

In the conduct of research where humans are the subjects, the investigators adhered to the policies regarding the protection of human subjects as prescribed by 45 CFR 46 (Protection of Human Subjects).

1990 APS
ABSTRACT FORM

ABSTRACT MUST BE RECEIVED AT APS OFFICE BY FRIDAY, JUNE 1, 1990

Mail to:
Membership Services Department
American Physiological Society
9650 Rockville Pike
Bethesda, Maryland 20814

MAILING ADDRESS OF FIRST AUTHOR
(Please print in black ink or type. Provide full name rather than initials.)

L. E. Wittmers, Jr.
Dept. of Physiology
Univ. of Minn., Duluth
10 University Drive
Duluth, MN 55812

Phone: Office (218) 726-8551
Home/Holiday (218) 525-6273

SELECT CATEGORY NUMBERS & TITLES (SEE TOPIC CATEGORY LIST);

1st #58 Title: Temp. Reg.

2nd # 51 Title: Exercise

3rd # 57 Title: Hypothermia

IMPORTANT

1. Prepare abstract carefully, on this form only.
2. Also fill out:
   a. Topic category selection
   b. Mailing address of first author
   c. Signature block for member's signature
3. Return to APS Office by June 1, 1990:
   a. The original typed abstract form
   b. 2 photocopies
   c. Abstract handling fee—$25
   d. Program Confirmation Card
4. See over for complete instructions.

REMITTANCE
ABSTRACT HANDLING FEE $25
Payable to APS

THE ROLE OF LIGHT EXERCISE ON THE ONSET AND INTENSITY OF SHIVERING IN COLD EXPOSED HUMANS. L. E. Wittmers, D. Israel* and R.G. Hoffman* Hypothermia and Water Safety Laboratory, Depts. of Physiology and Behavioral Sciences, University of Minnesota-Duluth School of Medicine, Duluth, MN 55812.

One response to cold exposure is shivering, which produces heat to maintain core temperature. It would seem reasonable that if cold exposure was coupled with exercise, the extra heat produced might affect shivering. In order to investigate this possibility, 13 lightly dressed male volunteers were exposed to 1°C air for three hours. Surface EMG activity was monitored on seven muscle groups. Rectal and skin temperatures were monitored throughout the experiment. Two 12 minute exercise periods were scheuled during the first hour of exposure. During exercise the subject maintained his heart rate at 70% of the predicted maximum. Thirty second EMG samples were obtained, at a predetermined time, via analog to digital conversion and the root mean square (RMS) voltage computed as an estimate of shivering intensity. In the protocols containing the exercise components the onset of shivering is delayed well into the second hour, in contrast to the first half hour in the nonexercise protocols. By the end of the second hour shivering in the exercise protocols exceeded that demonstrated in the controls. Rectal temperatures in the exercise experiments rose during exercise up to 60 minutes (+0.6 0°C) then decreased, reaching comparable values to the controls by the end of the experiment. Skin temperatures were not significantly different when the exercise and non exercising protocols were compared. The increased core temperature resulting from the exercise could have overridden the peripheral input at the hypothalamic level,resulting in a delayed shiver onset. (Supported in part by U.S. Army Medical Research Support Grant#DAMD17-88-C-8054 and U. S. Naval Medical Research Command Grant#N00014-88-k0582).

Opinions, interpretations, conclusions and recommendations are those of the author and are not necessarily endorsed by the U.S. Army or the U.S. Navy.

In the conduct of research where humans are the subjects, the investigators adhered to the policies regarding the protection of human subjects as prescribed by 45 CFR 46 (Protection of Human Subjects).

All compounds that are designated by code or initial letters must be identified adequately in the abstract, e.g., MJ-1999: 4-(2-isopropylamino-1-hydroxyethyl) methanesulfonanilide hydrochloride.

Member of:
☑ APS, ☐ ASZ, ☐ CRS, ☐ CSZ, ☐ SEB

☐ Submitted for special CRS Student Award

Lorentz E. Wittmers, Jr.
Member's Name. Print or type.

Lorentz E. Wittmers Jr
Member's Signature

Telephone No. (218) 726-8551

DO NOT FOLD THIS FORM

ABSTRACT MUST BE RECEIVED AT SOCIETY OFFICE BY TUESDAY, DECEMBER 3, 1991.

Mail to your Society of membership
APS, ASPET, AAP, AIN, AAI:
ASBMB, CIS, SMI, AAVI members send to AAI
ASCB and ISB members send to AAP
BMES, SEBM and NASB send to APS
9650 Rockville Pike
Bethesda, MD 20814-3998

1992 FASEB

ABSTRACT FORM

DO NOT FOLD THIS FORM

MAILING ADDRESS OF FIRST AUTHOR
(Please print in black ink or type. Provide full name rather than initials.)

Lorentz E. Wittmers
Dept. of Medical and
Molecular Physiology
Univ. of Minnesota, Duluth
School of Medicine
10 University Drive
Duluth, MN 55812-2487
Phone: Office (218) 726-7934
Home/Holiday 525-6273

PRESENTATION PREFERENCE (Check one)

☐ Oral ☒ Poster ☐ Indifferent

Final decision regarding presentation format is at the discretion of the programing society.

SELECT CATEGORY NUMBERS & TITLES
(See Topic Category Lists)

1. 763-1 Cold Exposure
2. 774-1 Temp. Reg.
3. 772-1 Hypothermia

STUDENT AWARDS

Check below if abstract is submitted for student award.

___ APS Student Award
Specify _____
___ AIN/Procter & Gamble
Grad. Student Res. Award
___ AAP Experimental Pathologist-in-Training Award

SEE OVER FOR COMPLETE INSTRUCTIONS

REMITTANCE (NONREFUNDABLE)
ABSTRACT HANDLING FEE $30
Payable to FASEB

THE EFFECT OF SHIVER SUPPRESSION ON CORE TEMPERATURE IN COLD STRESSED MAN.

Lorentz E. Wittmers, Richard G. Hoffman and David Israel. University of Minnesota-Duluth, Duluth MN 55812.

Shivering is a response to cold exposure that produces heat to maintain the body's core temperature. The magnitude of the shivering can be suppressed by voluntary maneuvers. The data presented evaluates the effect of shiver suppression on the maintenance of core temperature. Nine male volunteers were exposed to 20°C air for three hours at two different times. Subjects were instructed to suppress their shivering while performing motor tasks, by either repeated breath holding or conscious relaxation. These maneuvers were repeated at 30 minute intervals throughout exposure. Shivering magnitude was evaluated by computing the RMS voltage of the EMG signal from the trapezius and pectoralis major. Greater core temperature drops occurred in those experiments in which the shiver suppression techniques were employed. The RMS voltage between shiver suppression maneuvers was also higher than the control condition, suggesting a compensatory mechanism. Although the total time during which the shivering was actively suppressed was only 12-13% of the total exposure time, there was clearly a greater decrease in core temperature with shiver suppression. Supported in part by the U.S. Army DAMD17-88-C-8054 and the U.S Navy NOO14-88-K-0582.

Opinions, interpretations, conclusions and recommendations are those of the author and are not necessarily endorsed by the U.S. Army or the U.S. Navy.

In the conduct of research where humans are the subjects, the investigators adhered to the policies regarding the protection of human subjects as prescribed by 45 CFR 46 (Protection of Human Subjects).

Blue lines are printer's cut lines; do not type on or outside of these lines.

All compounds that are designated by code or initial letters in the title must be identified adequately in the abstract, e.g., MJ-1999; 4-(2-isopropylamino-1-hydroxyethyl) methanesulfonanilide hydrochloride.

All investigators must adhere to the guidelines as listed on the reverse of the abstract form.

APS, BMES, SEBM, ASPET & AIN members only:
Signing member, are you willing to chair a session? ☐ Yes, category # _____

MEMBER'S AFFILIATION (Check one only):
☒ APS ☐ ASBMB ☐ ASPET ☐ AAP ☐ AIN ☐ AAI ☐ ASCB ☐ BMES ☐ SEBM ☐ CIS ☐ SMI ☐ AAVI ☐ ISB ☐ NASB

Submission of signed form indicates acceptance of rules including final withdrawal date of January 8, 1992. No exceptions will be made.

Lorentz E. Wittmers, Jr.
Member's Name (Print or type)

Lorentz E. Wittmers Jr
Member's Signature

(218) 726-7934 525-6273
Member's Phone

Attached is a copy of a manuscript submitted for publication to the Journal of Aviation, Space, and Environmental Medicine.

SUPPRESSION OF SHIVERING BY BREATH HOLDING, RELAXATION, MENTAL ARITHMETIC, AND WARM WATER INGESTION

DAVID J. ISRAEL B.A., M.S., LORENTZ E. WITTMERS, MD., Ph. D., RICHARD G. HOFFMAN, M.A., Ph. D., ROBERT S. POZOS, M.S., Ph. D.

Department of Medical and Molecular Physiology and the Department of Behavioral Sciences, University of Minnesota, Duluth, School of Medicine, Duluth, MN 55812

Running Head:
SUPPRESSION OF SHIVERING

Corresponding Author: David Israel
Department of Medical and Molecular Physiology
359 School of Medicine, University of Minnesota, Duluth
10 University Drive
Duluth, MN 55812
(218) 726-8551 FAX (218) 726-6356

Footnote to First Page of Text:
From the Hypothermia and Aquatic Safety Laboratory, Department of Medical and Molecular Physiology, (D.J. Israel, L.E. Wittmers); Department of Behavioral Sciences, University of Minnesota, Duluth, School of Medicine, Duluth, Minnesota (R.G. Hoffman); and The Naval Health Research Center, P.O. Box 85122, San Diego, CA (R.S. Pozos).

Abstract:

Four methods of suppressing cold-induced shivering were evaluated in 26 young male volunteers exposed to 0.0 ± 1.0°C air for 135 minutes. Voluntary relaxation of musculature (R), breath holding (BH), warm (50°C) water ingestion (W), and performance of a mental arithmetic task (MA) were applied in a counterbalanced order following 2 hours of cold exposure. Surface electromyograms of seven muscles were recorded and converted to root mean square voltage (RMS) as a measure of shivering intensity. Mean skin and rectal temperatures decreased significantly, 4.9°C and 0.3°C respectively ($p \leq 0.01$). Mean reduction of EMG activity was 35% during R, 24% during BH, 18% during MA, and 5% during W. R was significantly more effective than BH, MA, and W, and BH and MA were significantly more effective than W in reducing shivering. These results indicate that, at small decreases in rectal temperature, shivering can be voluntarily suppressed to some extent during relaxation, breath holding, and mental arithmetic.

thermoregulation, electromyogram, humans, cold air exposure

Abstract:

Four methods of suppressing cold-induced shivering were evaluated in 26 young male volunteers exposed to 0.0 ± 1.0°C air for 135 minutes. Voluntary relaxation of musculature (R), breath holding (BH), warm (50°C) water ingestion (W), and performance of a mental arithmetic task (MA) were applied in a counterbalanced order following 2 hours of cold exposure. Surface electromyograms of seven muscles were recorded and converted to root mean square voltage (RMS) as a measure of shivering intensity. Mean skin and rectal temperatures decreased significantly, 4.9°C and 0.3°C respectively ($p \leq 0.01$). Mean reduction of EMG activity was 35% during R, 24% during BH, 18% during MA, and 5% during W. R was significantly more effective than BH, MA, and W, and BH and MA were significantly more effective than W in reducing shivering. These results indicate that, at small decreases in rectal temperature, shivering can be voluntarily suppressed to some extent during relaxation, breath holding, and mental arithmetic.

thermoregulation, electromyogram, humans, cold air exposure

Introduction:

During cold exposure, activation of peripheral cold receptors and central thermosensitive structures generates afferent inputs to thermoregulatory centers. In mammals the hypothalamus contains the primary thermoregulatory center, but subhypothalamic areas of the brainstem and spinal cord are also capable of transforming thermal input signals to efferent signals controlling thermoregulatory effectors (26). Activation of these centers initiates and maintains the efferent neuronal signals which increase muscle activity to produce heat and modify posture to reduce heat loss (10,18). As the cold stimulus increases, this activity progresses from increased muscle tone without visible tremor (preshivering tone) to visible shivering, which is characterized by bursts of tremor (10). Fully developed shivering exhibits a species-specific rhythm resulting from the grouped discharge of motor units (13). It is likely that the grouped discharges are generated at the level of the spinal cord since these types of group discharges have not been observed in the descending supraspinal drive signal for shivering (2), and because shivering can be elicited even in chronically spinalized dogs and rabbits by cooling of the spinal cord (15). Thus it appears that shivering is initiated and modulated in both central and spinal centers.

Although shivering is considered an involuntary response, like respiration, it can be inhibited temporarily (10). Glaser et al.(8) noted that at low intensities shivering can be temporarily

suppressed by voluntary relaxation and cessation of breathing. Glickman et al.(9) reported that even after 4 hours of exposure to -29.9°C air, their subjects were able to effectively suppress shivering by relaxing.

In addition to relaxation, shivering can be suppressed by a number of other non-thermoregulatory mechanisms. Martin and Cooper (19), and Klenow et al. (14) noted that shivering, as measured by electromyographic (EMG) activity, consistently decreased during a mental arithmetic task, while isometric muscle contractions resulted in variable effects. Other non-thermal sensory stimuli that are known to suppress the shivering response in mammals include mechanical pressure on the eyeball, mechanical pressure on the skin (5,15), stretching a muscle (10), and electrical cutaneous nerve stimulation with a rate less than 50 Hz (15). In contrast, noxious stimuli such as twisting the pinna (27), pin pricks, blowing on the hair of the back, and electrical cutaneous nerve stimulation at a rate greater than 50 Hz have been reported to increase shivering intensity (15). Cardiovascular and respiratory reflexes also modulate the shivering response. Low carotid sinus pressure (11), lung inflation (23), hypoxia (6), and hypercapnia (7) have all been demonstrated to inhibit shivering.

As would be expected, thermal stimuli have been shown to have an effect on shivering intensity. For example, cooling of the respiratory tract during cold exposure stimulates shivering by increasing afferent input from esophageal cold receptors (4), and application of radiant heat to the face decreases EMG activity of

the biceps brachii, trapezius, and rectus femoris in subjects exposed to -3°C air for 1 hour (22).

The muscle tension and tremor of shivering may impede performance in individuals who must undertake tasks that involve motor speed and accuracy under cold stress. Outdoor sportsmen, commuters caught unaware of severe weather conditions, or military personnel who must perform their operations under extreme weather conditions are just a few examples of critical situations when loss of fine motor control or motor speed could prove disastrous. Temporary suppression of shivering during performance of fine motor tasks may be one way to improve performance during cold exposure. Indeed some shiver suppression techniques may be currently in use. For example, breath holding while shooting is a standard marksmanship technique, and mental concentration on a task may unconsciously inhibit shivering. Hemingway, et al. (10) have suggested that some suppression of shivering takes place whenever a voluntary movement is initiated.

Despite the these references to the ability of man to suppress shivering, there have been few attempts to quantify the relative effectiveness of methods of shiver suppression or correlate this suppression with changes in electromyographic activity (14,19). The purpose of these experiments was to evaluate the effectiveness of four shiver suppression techniques which may be applied to reduce the intensity of shivering in humans.

Materials and Methods:

Twenty-six male volunteers, 21 to 35 years of age, were informed as to the general purpose, procedure, and possible risks of the experiments, and they gave their written consent prior to participation. Protocols for this project were approved jointly by the University of Minnesota Committee on the Use of Human Subjects in Research, the United States Army, and the United States Navy prior to subject recruitment.

Volunteers were screened with a 12-lead electrocardiogram (ECG) interpreted by a physician and a treadmill exercise test. Body fat was measured by hydrostatic weighing. Volunteers with an abnormal ECG, inadequate performance on the exercise test, body fat content in excess of 25%, or using prescription medications were eliminated from the subject pool. Subjects were then familiarized with the experimental protocol during an orientation session. At least one week passed between the orientation and the first cold exposure test.

All experiments were conducted in a thermostatically controlled environmental chamber at 0.0 ± 1.0°C. After subjects were outfitted at room temperature (approximately 21°C) with skin and rectal thermocouples, ECG transmitter, and EMG electrodes, they donned cotton underwear and socks, cotton/polyester long sleeved shirts, cotton long pants, and warm weather boots.

Rectal temperature (T_R) was monitored with a disposable rectal thermocouple (Type T, Physiotemp, Inc., Clifton, NJ) inserted approximately 8 cm beyond the anus. A modified lead 2 ECG was monitored by telemetry (Markham Industries) throughout cold exposure to ensure subject safety. Skin temperature was monitored

using copper-constantan skin thermocouples (#SST-1. Sensortek, Inc., Clifton, NJ) on the right medial calf, right medial thigh, right lateral arm, and chest above the medial end of the left clavicle. Mean skin temperature (T_{MS}) was calculated employing the approach of Ramanathan (24); see Equation 1.

$$T_{MS} = 0.3(\text{chest} + \text{arm}) + 0.2(\text{calf} + \text{thigh}) \quad (1)$$

Temperatures were sampled 6 times per minute and one minute averages were recorded to the nearest 0.1°C using a computerized data acquisition system (Macintosh microcomputer, Apple Computer, Inc., Cupertino, CA, A/D board and Analog Connection Workbench data acquisition software from Strawberry Tree Inc., Sunnyvale, CA).

Surface EMGs were monitored using bipolar Ag/AgCl surface electrodes (#D496-4, AA Biomedical, Windsor CA) over seven muscle groups: superior border of the trapezius, pectoralis major, biceps brachii, triceps brachii, rectus femoris, biceps femoris, and soleus. All muscle groups were sampled on the right side. Bipolar electrodes were spaced 3 cm apart over the belly of each muscle with the most distal electrode acting as the ground. The skin was cleaned and gently abraded with an alcohol saturated pumice pad before electrode application. EMG signals were monitored with a Nicolet Viking EMG system (Nicolet Biomedical Inc., Madison, WI), and recorded on magnetic tape (Hewlett-Packard #3968A Instrumentation Recorder, San Diego, CA) for subsequent analysis. The EMG signals were sampled at 1024 Hz and analyzed

utilizing a DEC VAXLAB-GPX™ (Digital Equipment Corporation, Marlboro, MA) and ILS™ software (Signal Technology, Inc., Goleta, CA). Root Mean Square Voltage (RMS) values were calculated for approximately 30 second segments of continuous data (equation 2).

$$RMS = \sqrt{\frac{Y_1^2+Y_2^2+\ldots+Y_n^2}{n}} \qquad (2)$$

where Y is the voltage measured at the sample point and n is the total number of sample points. Control data samples were taken from the middle of a recorded two minute baseline which preceded each shiver suppression technique when no activity from voluntary motion was evident. Experimental data samples were taken from the shiver suppression periods as described below. RMS data were analyzed using SPSS software (SPSS Inc. Chicago, Ill) on a Macintosh microcomputer, (Apple Computer, Inc., Cupertino, CA) by 3-factor analysis of variance (ANOVA) for repeated measures with 7 levels of muscle, 4 levels of shiver suppression technique, and 2 levels of time. Tukey post-hoc comparisons were computed between suppression techniques. One way analysis of variance was used to compare control values to values for each shiver suppression test. Mean rectal, and mean skin temperatures at the beginning and end of exposure were compared using paired Student's T-tests. Differences were considered significant at $p \leq 0.05$.

After instrumentation subjects entered the 0°C chamber and remained there for approximately 2 hours before performing the

four shiver suppression techniques. During these 2 hours they performed motor skill and psychological performance tests requiring minimal physical exertion (e.g. simulated firearms marksmanship tasks, computerized cognitive aptitude battery). Results of these tests will be reported separately. Shiver suppression tests were performed at the end of these experiments to allow sufficient time for the development of intense shivering. After 2 hours of exposure subjects were instructed to stand with arms at their sides and refrain from any unnecessary movements while electromyographic activity was monitored during control periods and shiver suppression techniques.

Each subject performed four shiver suppression techniques in a counterbalanced order during the same exposure. Two minutes of undisturbed shivering preceded each technique. The activity during these 2 minutes was recorded as a baseline level. The four techniques employed were: (1) Breath holding; the subject was instructed to hold his breath for 30 seconds. (2) Relaxation; the subject was instructed to stand still and attempt to relax his entire body as much as possible for one minute. (3) Warm water ingestion; the subject was instructed to drink 177 ml. of warm (50°C) water within one minute. (4) Mental arithmetic; two columns of random two digit numbers were displayed side by side on a sheet of paper. The subject was instructed to add as many of these pairs together as he could in one minute, verbalizing only the answer for each calculation. Data was sampled for analysis from the 2-minute control periods before each technique, and from the period of time when the subjects were performing each

technique with the exception of warm water ingestion when data was sampled immediately after the subject set down the empty cup. The subjects had been previously familiarized with the four techniques during the orientation session. Instructions for each shiver suppression method were typed on a card and placed face down in front of the subject. After each two minute control period the subject read the card, put it down and followed the instructions when signaled to proceed. Subjects remained in the same standing position with arms at their sides for both control and shiver suppression periods.

Results:

The average of the mean skin temperatures for all subjects decreased from 32.5 ± 0.21 to 27.6 ± 0.38°C by the end of the cold exposure (135 minutes). The mean rectal temperature of all subjects decreased significantly ($p \leq 0.01$); 0.3°C from 37.6 ± 0.06 to 37.3 ± 0.06°C during exposure (mean + standard error). Mean skin and rectal temperatures for the entire exposure are presented in Figure 1.

When data from all muscles were pooled, reductions in shivering intensity were 35.2 ± 3.4% during relaxation, 24.1 ± 2.0% during breath holding, 18.1 ± 3.2% during mental arithmetic, and 4.8 ± 5.0% after warm water ingestion. Three-factor ANOVA between pooled data indicated that relaxation was more effective in reducing shivering than breath holding, mental arithmetic, and warm water ingestion ($p \leq 0.05$). Breath holding and mental arithmetic were more effective than warm water ingestion. Breath

holding and mental arithmetic did not have significantly different effects on the pooled EMG activity.

The trapezius and rectus femoris muscles consistently showed the greatest EMG activity during both control shivering and experimental shiver suppression periods. An example of the EMG activity during shivering and suppression for one subject is presented in Figure 2. The reductions in shivering intensity, as measured by mean RMS of surface EMGs of each monitored muscle, are presented in Figure 3. Significant reduction in shivering intensity ($p \leq 0.05$) occurred in 6 of 7 muscles monitored during relaxation, 3 of 7 muscles monitored during breath holding, 2 of 6 during mental arithmetic, and none of the muscles after warm water ingestion. The largest reduction in shivering occurred during the relaxation technique in all muscles. Data for the biceps brachii during the mental arithmetic task were omitted since a number of subjects held the test card during this maneuver, resulting in increased voluntary EMG activity in the biceps brachii which interfered with recording the EMG activity due to shivering.

Discussion:

The protocol of these experiments was designed so that shiver suppression tests were performed after 2 hours of 0°C cold exposure in order to induce significant decreases in skin and core temperatures and establish intense shivering in the subjects. At this reduced, but not hypothermic core temperature, the subjects were able to voluntarily suppress their shivering by concentrating on relaxing their musculature as well as by holding

their breath, and to lesser extent by performing mental arithmetic calculations. Very little effect was noted after ingestion of warm water; however, greater quantities of water could have a greater effect if enough heat was added to the body to increase the core temperature. Shivering was suppressed immediately upon beginning relaxation and breath holding, or mental arithmetic, and resumed again immediately after the subjects were instructed to stop the technique. It is possible that shivering can be suppressed for longer periods of time than the 30-60 seconds designated in these experiments. Eventually, however, thermoregulatory drive would probably overcome this suppression, especially at lower core temperatures which would result from prolonged suppression of shivering. In another study EMG activity did show a rebound effect between repeated periods of shiver suppression in a later study, increasing above baseline levels (our unpublished data). Similarly, if these techniques were applied earlier in cold exposure during the dynamic phase of change in skin and rectal temperatures, it is possible that the additional thermoregulatory drive may have prevented suppression of shivering to this degree.

These results are in agreement with the findings of Glaser and Jones (8), Glickman et al. (9), and Martin and Cooper (19,20) who visually observed that shivering was reduced during similar relaxation, respiratory, or mental arithmetic maneuvers, although they did not quantify the electromyographic reduction in shivering intensity. Klenow et al. (14) found a similar reduction in EMG

RMS values during shivering with the performance of mental arithmetic calculations.

The common application of relaxation and breath holding to motor steadiness tasks such as marksmanship indicates that with practice such techniques are beneficial to performance. Initially, however, concentrating on a suppression technique may distract the individual from the task more than the shivering (our unpublished data). In addition, prolonged suppression of shivering and heat conserving posture will result in reduced heat production and increased heat loss (17, 26). Obviously, the utility of shiver suppression must be weighed against the risks involved. Intuitively, application of the most effective and least distracting techniques for short periods of time would be most likely to provide some improvement in performance with minimal loss of heat generation and conservation. With further refinement and greater understanding of the mechanisms of shiver suppression, however, its utility may be improved and its detriments may be minimized.

The results of this study do not address the mechanisms of shiver suppression, however, several possibilities are alluded to in the literature. Lupandin (17) presents evidence that there are a number of excitatory and inhibitory influences on shivering, including vestibular, postural, proprioceptive, and nociceptive pathways. During the early stages of thermoregulatory muscle tone, before visible tremor has developed, postural reflexes and position significantly affect the intensity of shivering in a particular muscle (21). Upright posture may activate postural

reflexes that augment shivering, especially in extensor muscles. Thus the mechanism of shiver suppression may be integrated with reflex and voluntary motor systems and is essential for performance of motor and postural functions. This could account for the consistently greater EMG activity in the trapezius, rectus femoris, and soleus muscles. These muscles were activated not only by the thermoregulatory drive for shivering but also to maintain an upright posture.

Martin and Cooper (19), and Klenow, et al. (14) reported reductions in shivering intensity during performance of mental arithmetic similar to the data presented here. They suggest that the cerebral cortex exhibits a secondary modulating influence on the hypothalamic control of shivering. Some cerebral inhibitory pathways have been identified. For example, Stuart et al. (26) found that in cats, septal stimulation of high intensity inhibited shivering. Kaada (12) has shown that shivering can be inhibited by electrical stimulation of a large number of points on the cerebral cortex. Cortical connections to the efferent thermoregulatory pathway may also allow voluntary inhibition of the descending drive for shivering. For example, the brainstem reticular formation, which can influence muscle tone via gamma motor neuron activation, has direct cortical connections (3). Therefore, suppression of shivering and other muscle tone during cognitive tasks or fine motor movements could be mediated via several pathways.

Cardiovascular reflexes are also known to affect the intensity of shivering. Decreases in carotid sinus pressure

result in the suppression of shivering (11,23). Baroreceptor stimulation suppresses gamma motor activity and skeletal muscle tone (25). During the breath holding technique used in the present experiments a Valsalva maneuver may have taken place in our subjects, causing changes in venous return and cardiac output and resulting in transient reductions in blood pressure. In addition, the reduction of upper airway cooling when subjects held their breath could have reduced the afferent drive for shivering. Both of these mechanisms could contribute to reduction in shivering intensity.

Increases in heart rate, cardiac output, and peripheral (forearm) blood flow resulting from performing mental arithmetic, cold pressor, and reaction time tasks have been demonstrated by Allen et al. (1). These reflexes would be expected to raise blood pressure, thus augmenting shivering, not suppressing it as was observed. If a task caused an increase in skin blood flow, however, shivering may have been suppressed by skin warming. Unfortunately, the recording rate of our temperature monitoring system was too low to accurately detect transient changes in skin temperature, and blood pressures and heart rates were not monitored during shiver suppression. Future investigations should be designed to monitor cardiovascular and skin blood flow during these maneuvers to determine the influence of these mechanisms.

In summary, under the above moderate cold stress conditions, thermoregulatory shivering can be temporarily suppressed by several techniques including relaxation of the musculature, breath holding, and performing mental calculations. Further studies

should address the duration through out which this suppression is effective, whether this suppression results in improved motor performance during cold exposure, and what mechanisms are involved.

Acknowledgments:

This research was funded in part by grants from the U.S. Army Medical Research and Development Command, Contract #DAMD17-88-C-8054 and U.S. Navy #N0014-88-K-0582.

Opinions, interpretations, conclusions and recommendations are those of the author and are not necessarily endorsed by the U.S. Army or the U.S. Navy.

In the conduct of research where humans are the subjects, the investigators adhered to the policies regarding the protection of human subjects as prescribed by 45 CFR 46 (Protection of Human Subjects).

References:

1. Allen MT, Ogrist PA, Sherwood A, Crowell MD. Evaluation of myocardial and peripheral vascular responses during reaction time, mental arithmetic, and cold pressor tasks. Psychophysiology. 1987; 24:648-656.

2. Birzis L, Hemingway A. Efferent brain discharge during shivering. J. Neurophysiol. 1957; 20:156-66.

3. Carpenter MB. Human Neuroanatomy. Baltimore: Williams and Wilkins, 1976; 267-9.

4. Cort JH, McCance RA. 1953. The neural control of shivering in the pig. J. Physiol. (Lond) 120: 115-21.

5. D'Anna L. Inhibition of shivering obtained by peripheral stimulation. Experientia 1967; 23:638.

6. Gautier H, Bonora M, Schultz SA, Remmers JE. Hypoxia-induced changes in shivering and body temperature. J. Appl. Physiol. 1987; 62:2477-84.

7. Girling F, Topliff EDL. The effect of breathing 15%, 21%, and 100% oxygen on the shivering response of nude human subjects at 10°C. Can. J. Physiol. Pharmacol. 1966; 44: 495-499.

8. Glaser EM, and Jones RVH. The initiation of shivering by cooled blood returning from the lower limbs. J. Physiol. (Lond) 1951; 114:277-82.

9. Glickman N, Mitchell HH, Keeton RW, Lambert EH. Shivering and heat production in men exposed to intense cold. J. Appl. Physiol. 1967; 22(1):1-8.

10. Hemingway A. Shivering. Physiol. Rev. 1963; 43:397-422.

11. Ishii K, Ishii K. Carotid sinus reflex acting upon shivering. Tohoku J. Exp. Med. 1960; 72:229-36.

12. Kaada BR. Somato-motor, autonomic and electrocorticographic responses to electrical stimulation of "rhinencephalic" and other structures in primate, cat, and dog. Acta Physiol. Scand. 24 suppl. 1951; 83:105.

13. Kleinbeckel D, Klussmann FW. Shivering. In: Schönbaum E, Lomax P, eds. Thermoregulation Physiology and Biochemistry. New York: Pergamon Press, 1989: 235-53.

14. Klenow C, Simmons F, Pozos R. Decrease in shivering by mental computation. (Abs.) 17th Annual Meeting, Society for Neuroscience, New Orleans, Louisiana, 1987.

15. Kosaka M. Reflex inhibition of cold shivering due to electrical stimulation of the cutaneous nerve fiber. Nagoya Med. J. 1975; 20(3.4):167-177.

16. Kosaka M, Simon E. Kältetremor wacher, chronisch spinalisierter Kaninchen im Vergleich zum Kältezittern intakter Tiere. Pflügers Arch. 1968; 302:333-356.

17. Lupandin, YV. Interaction of thermal and non-thermal receptory information in the process of organizing of thermoregulatory activity of motoneuronal pool. In: Academy of Sciences of the U.S.S.R. Sensory systems: Sensory interaction and prostheses. Leningrad: Nauka, 1983; 95-110.

18. Lupandin YV. The role of the fusimotor system in the control of shivering. Sechenov Physiological J. USSR. 1979; 65: 1661-70.

19. Martin SM, Cooper KE. Factors which affect shivering in Man during cold water immersion. Pflügers Arch. 1981; 391:81-83.

20. Martin SM, Cooper KE. Factors which attenuate or abolish shivering in man during cold water immersion. Can. J. Physiol. 1979; 10:43.

21. Meigal AYu, Kuzmina GI. Influence of posture on thermoregulatory activity of shoulder muscles. Fiziol. Cheloveka. 1989; 15 (6):147-149.

22. Mekjavic, IB, Eiken, O. Inhibition of shivering in man by thermal stimulation of the facial area. Acta Physiol. Scand. 1985; 125:633-7.

23. Mott JC. The effects of baroreceptor and chemoreceptor stimulation on shivering. J. Physiol. 1963;166: 563-586.

24. Ramanathan NL. A New weighting system for mean surface temperature of the human body. J. Appl. Physiol. 1964; 19(3):531-3.

25. Shibata H, Nunomura T, Nagasaka T. Inhibition of shivering as a cause of metabolic suppression with norepinephrine in warm- and cold-acclimated rats. Jpn. J. Physiol. 1982; 32:519-527.

26. Simon E, Pierau K, Taylor DC. Central and peripheral thermal control of effectors in homeothermic temperature regulation. Physiol. Rev. 1986; 66: 235-300.

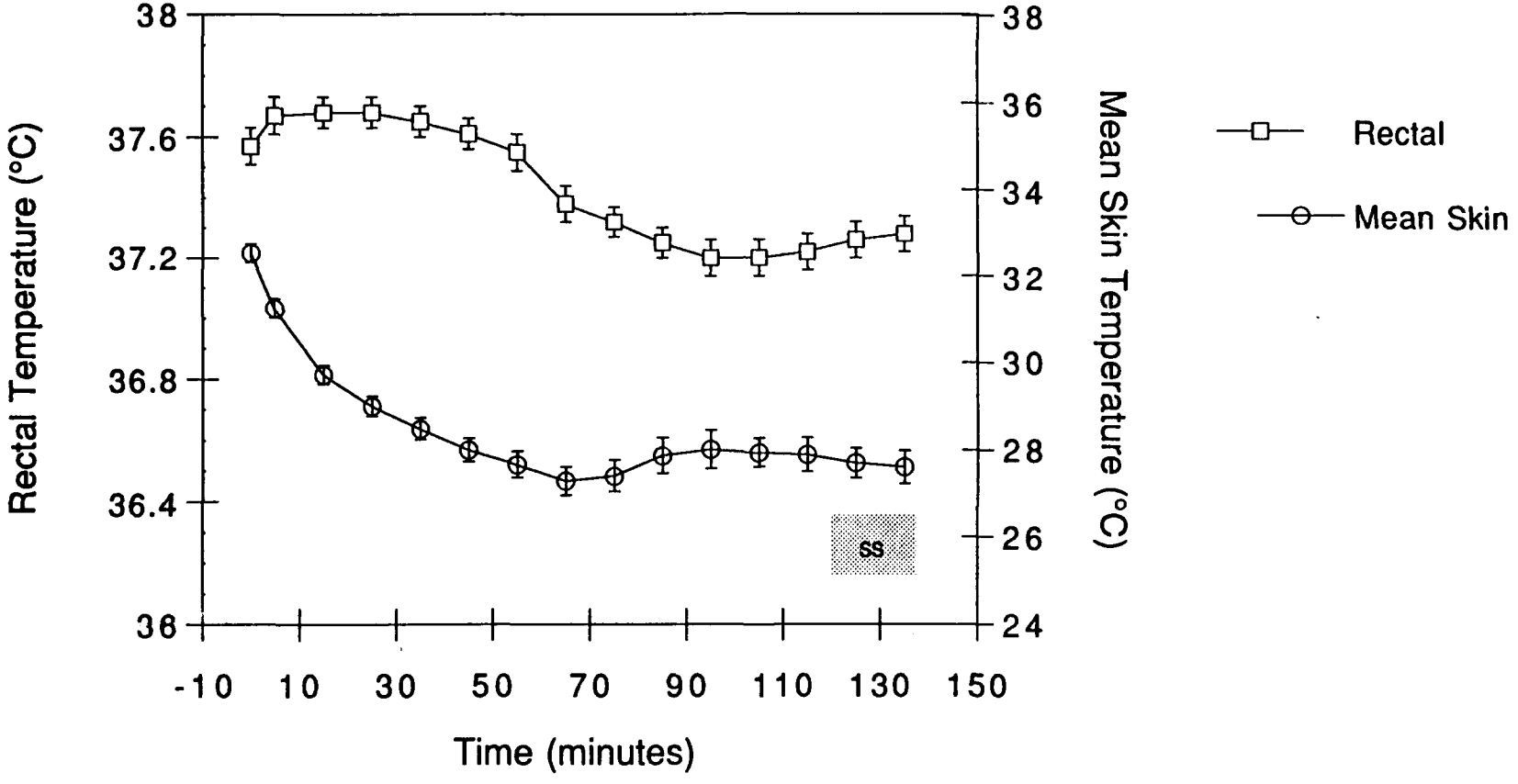
27. Von Euler C, Soederberg U. Coordinated changes in temperature thresholds for thermoregulatory reflexes. Acta Physiol. Scand. 1958; 42:112-129

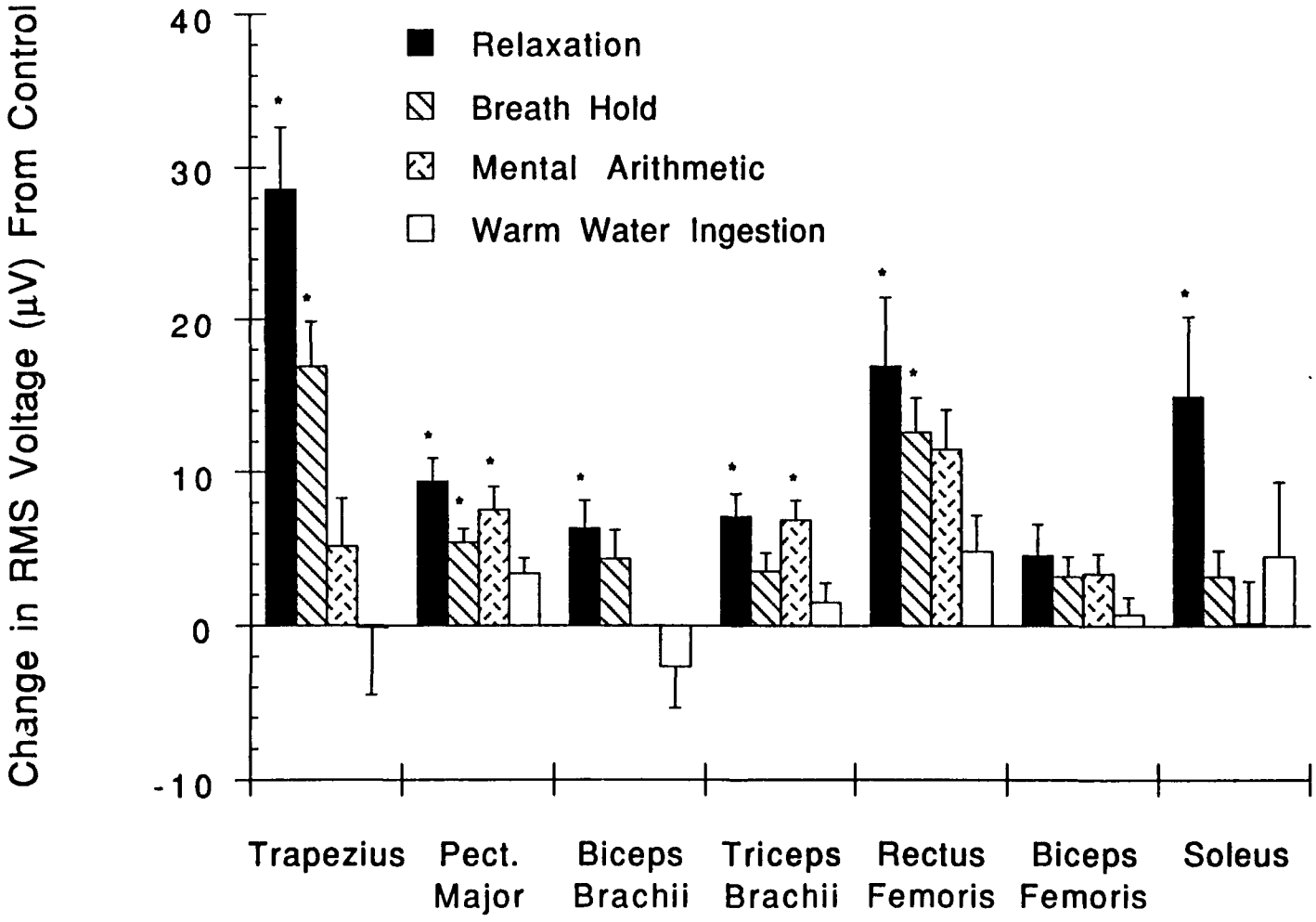
Figure Legends.

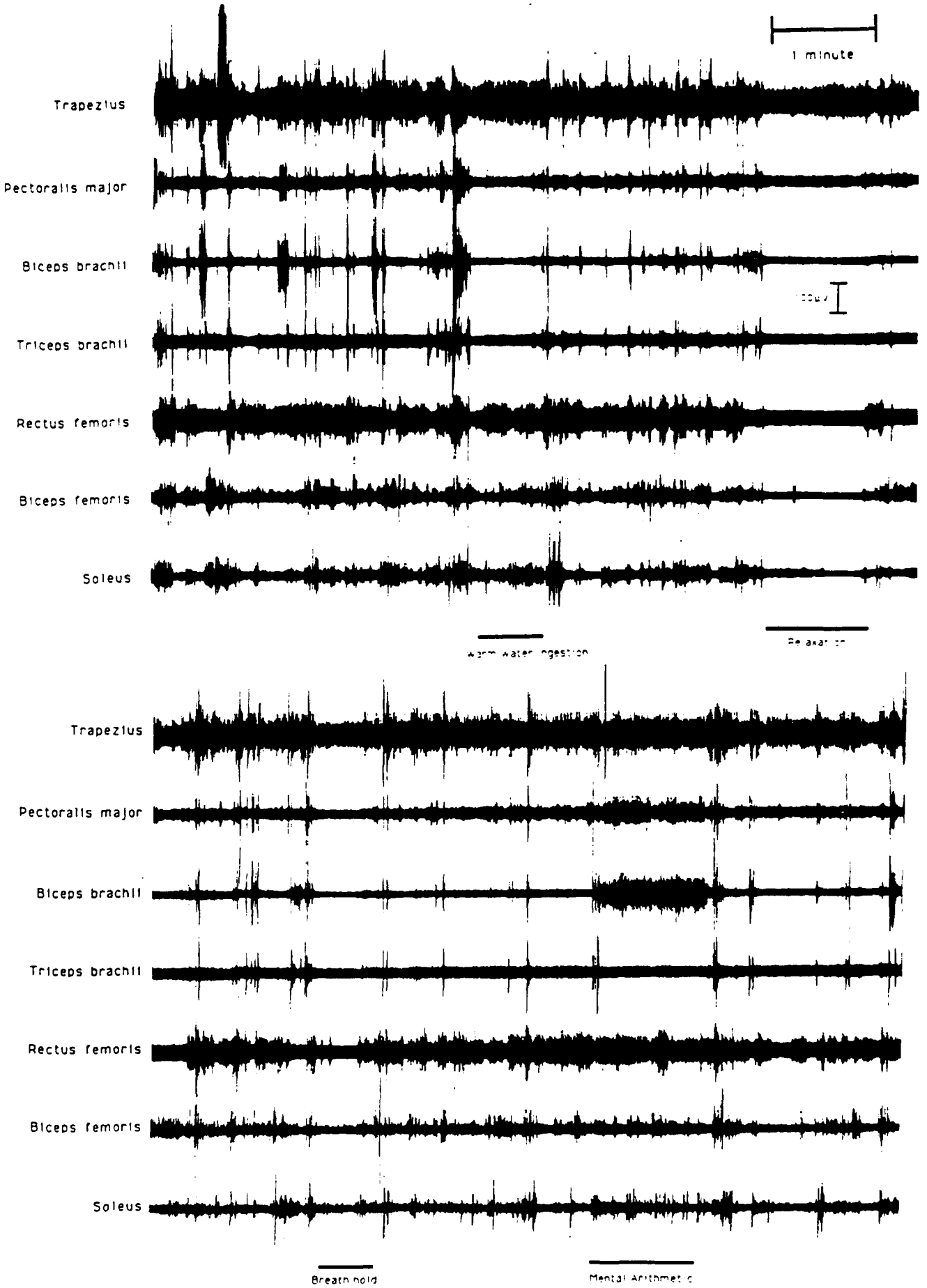
Figure 1. Mean rectal (squares) and mean skin (circles) temperatures during cold exposure (error bars indicate SEM). Shiver suppression techniques were applied during the shaded area labeled SS.

Figure 2. Sample EMGs of muscles monitored during application of shiver suppression techniques.

Figure 3. Mean reduction in shivering intensity (RMS voltage of EMGs) for the seven muscles during each shiver suppression technique. Asterisks indicate significant changes from control EMG activity ($p \leq 0.05$).


38
37.6
37.2
36.8
36.4
36
Rectal Temperature (°C)
38
36
34
32
30
28
26
24
Mean Skin Temperature (°C)
-10
10
30
50
70
90
110
130
150
Time (minutes)
SS
Rectal
Mean Skin


Change in RMS Voltage (μV) From Control
40
30
20
10
0
-10
Relaxation
Breath Hold
Mental Arithmetic
Warm Water Ingestion
Trapezius
Pect. Major
Biceps Brachii
Triceps Brachii
Rectus Femoris
Biceps Femoris
Soleus


1 minute
Trapezius
Pectoralis major
Biceps brachii
Triceps brachii
Rectus femoris
Biceps femoris
Soleus
Trapezius
Pectoralis major
Biceps brachii
Triceps brachii
Rectus femoris
Biceps femoris
Soleus

Appendix I

Informed Consent Form

Project title: Evaluation of Physiological and Psychological Impairment of Human Performance in Cold Stressed Subjects, Phase II.

Investigators: L. E. Wittmers and R. G. Hoffman

Consent Form

You are invited to participate in a study evaluating the effects of various stressful situations associated with a cold environment on human physiological and psychological performance. All studies will take place in the environmental chamber at the Hypothermia Laboratory - University of Minnesota Duluth. The project is under the direction of Drs L. Wittmers and R. Hoffman.

In order to participate in this project you will be prescreened to determine if you are physically fit and whether or not you fit the body type criteria necessary to participate. We will require a short medical history and a 12 lead resting electrocardiogram, interpreted by the staff of the Clinical Science Department. To determine your body composition you will be asked to sit on a chair in a warm swimming pool and immerse your head for 10-20 seconds at a time so that we may determine your weight underwater. From this underwater weight, your height, weight, and vital capacity we will calculate your percent body fat. Vital capacity is the volume of your lungs, and we will measure this by having you breath into a machine that will measure how much air you can exhale. If the electrocardiogram is normal and your body fat is within the required range you will be given a stress test. This will include walking (3 mph) on a treadmill with the grade increased at the rate of 2% up to a maximum of 18%. You will be considered as a candidate for participation if your heart rate does not exceed 90% of the predicted maximum (for your age and sex) and your systolic blood pressure does not exceed 200 mm. Hg. and diastolic blood pressure does not exceed 100 mm. Hg. at 18% grade. You will not be allowed to participate in these experiments if you are taking prescription or non-prescription medications.

If you pass the prescreening above, you will be requested to participate in one or more of the following five experimental situations each lasting no longer than 3 hours.

(1) Cold air - Cold water: You will be exposed to an ambient air temperature of 20° F and your legs will be wet up to the knees
in 50° F water.
(2) Cold air - Cold water - Sleep deprivation: You will be exposed to an ambient air temperature of 20° F and your legs will be wet up to the knees in 50° F water. The sleep deprivation will be for 24 hours preceding the experiment.
(3) Cold air - Cold water - exercise: You will be exposed to an ambient air temperature of 20° F and your legs will be wet up to the knees in 50° F water. The exercise will consist of holding up a 4 to 6 pound object at shoulder level for 8-12 minutes.
(4) Cold air - Cold water - Exercise - Sleep deprivation: You will be exposed to an ambient air temperature of 20° F and your legs will be wet up to the knees in 50° F water. The exercise will consist of holding up a 4 to 6 pound object at shoulder level for 8-12 minutes. The sleep deprivation will be for 24 hours preceding the experiment.
(5) Cold air alone. You will be exposed to an ambient air temperature of 20° F.
(6) Room temperature air. You will be exposed to an ambient air temperature of 72°F.

These protocols are designed to address the following questions (a) which of the various environmental-stress scenarios is the one that causes the greatest rate of rectal temperature fall, earliest onset of shivering and the greatest decrement in physiological and psychological performance, and (b) which muscles contribute the most to overall body oscillation during shivering and consequently the greatest decrement in performance.

During the experiment you will be asked to perform certain mental and physical tasks to evaluate performance. Each task and its meaning will be explained to you by one of the project directors. In order to monitor physiological changes you will be instrumented with temperature sensors (rectal thermistor and three skin surface thermistor probes - face, toe and finger). Surface doppler probes will be applied at intervals to measure blood flow. Electromyographic electrodes will be applied over selected skeletal muscle groups to evaluate shivering, and impedence cardiography electrodes will be attached to your skin to measure the output of your heart. At intervals you will be required to breathe into a mouthpiece for measurements of metabolic rate. On the day prior to the experiments you will be asked to drink nine16 oz. glasses of water, approximately one every 2 hours, in order to insure that you are adequately hydrated. You may be
required to give a blood, saliva, and urine specimen before, during and after completion of each experiment. The urine samples will be analyzed for catecholamines to assess the magnitude of stress, and the saliva and blood will be analyzed for substances which indicate the intensity of muscle activity and stress. The total amount of the blood sample, if taken, will be less than 50 ml (1.7 ozs) per experiment. A minimum of 72 hours will elapse between each experiment.

You will be paid $100 for each cold experimental condition and $25 for the warm control condition.

From our experience we expect that the protocols described above will cause only moderate discomfort. There will be some tiredness and fatigue associated with both the sleep deprivation and exercise aspects of the study. Exposure to cold will result in an increase in heart rate and blood pressure. There are potential risks of abnormal heart beats, however at the temperatures you will be exposed to these are extremely rare. You will be continuously monitored to allow us to minimize any risk. Cold exposure can cause tissue damage by freezing. You will have sufficient protective clothing to avert this tissue damage and your rectal and skin temperatures will be continuously monitored. There may be some mild discomfort in placing the rectal thermistor and having it in place while participating in the experiment. If you have any problems, please notify one of the project directors immediately.

Safety assurance is the responsibility of the project directors. There will be a physician on call in the building during the entire exposure period in the event of a medical injury.

Any subject can terminate his/her involvement at any time without affecting their relationship with the University of Minnesota, Duluth or the U. S. Army (the agency supporting this program). The benefits to be expected will be that we will gain more insight into how these cold-stress environments alter human physiological and psychological functioning.

Any information obtained in connection with this study that can be identified with you will remain confidential and will be disclosed only with your permission. In any written reports or publications, no one will be identified or identifiable and only aggregate data will be presented. A representative of the U. S. Army Medical Research and Development Command (USAMRDC) may inspect the records of this research but confidentiality will be preserved.

Your decision whether or not to participate will not affect your future relations with the University of Minnesota, Duluth School of Medicine or the U. S. Army in any way. If you decide to participate you are free to discontinue participation at any time without affecting such relationships.

You are authorized all necessary medical care for injury or disease which is the proximate result of your participation in this research. (If you receive an injury or contract a disease as a direct result of your participation in this project all medical expenses will be the responsibility of the research project.)

If you have questions about the research, please call Dr. L. E. Wittmers, 726-8551 or the other project director. If you have questions about the research subjects' rights or wish to report a research-related injury please call Dr. Ronald Franks, Dean, University of Minnesota, Duluth School of Medicine, Duluth, MN, 55812 (218-726-7571).

You will be offered a copy of this form to keep.

You are making a decision whether or not to participate. Your signature indicates that you have read the information provided above and have decided to participate. You may withdraw at any time without prejudice after signing this form.

_____ _____

Signature Date

_____ _____

Signature of Witness Signature of Investigator

Appendix II

Temperature Data

Table AII-1.

Warm condition
Rectal Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
0	38.3	37.8	37.9	37.7	37.7	37.3	37.4	37.9	37.9	37.8
1	38.2	37.8	37.8	37.7	37.7	37.3	37.4	38.0	38.0	37.8
2	38.2	37.9	37.9	37.7	37.7	37.3	37.4	38.0	38.0	37.8
3	38.2	37.9	37.8	37.6	37.7	37.2	37.5	38.0	38.0	37.8
4	38.3	37.8	37.8	37.7	37.7	37.3	37.5	38.0	38.0	37.8
5	38.2	37.9	37.8	37.7	37.8	37.3	37.4	38.0	37.9	37.8
6	38.2	37.9	37.9	37.7	37.7	37.3	37.5	37.9	37.9	37.8
7	38.2	37.8	37.8	37.7	37.7	37.2	37.5	38.0	38.0	37.8
8	38.1	37.9	37.8	37.7	37.7	37.3	37.5	37.9	38.0	37.8
9	38.2	37.9	37.8	37.7	37.7	37.2	37.5	38.0	38.0	37.8
10	38.2	37.9	37.8	37.6	37.6	37.3	37.4	38.0	37.9	37.7
11	38.2	37.8	37.8	37.7	37.6	37.2	37.4	38.0	38.0	37.7
12	38.2	37.8	37.8	37.6	37.6	37.2	37.5	38.0	37.9	37.7
13	38.2	37.8	37.8	37.6	37.7	37.2	37.4	38.0	38.0	37.7
14	38.2	37.8	37.9	37.7	37.6	37.2	37.4	37.9	38.0	37.7
15	38.2	37.9	37.8	37.7	37.6	37.2	37.4	38.0	38.0	37.8
16	38.1	37.8	37.7	37.6	37.6	37.2	37.4	38.0	38.0	37.7
17	38.1	37.8	37.7	37.7	37.6	37.0	37.4	38.0	38.0	37.7
18	38.1	37.8	37.7	37.7	37.6	37.1	37.5	38.0	38.0	37.7
19	38.1	37.7	37.7	37.7	37.6	37.1	37.4	37.9	37.9	37.7
20	38.1	37.8	37.6	37.6	37.6	37.1	37.4	38.0	38.0	37.7
21	38.0	37.8	37.7	37.7	37.6	37.1	37.4	38.0	37.9	37.7
22	38.1	37.9	37.6	37.7	37.6	37.1	37.5	38.0	37.9	37.7
23	38.2	37.9	37.7	37.7	37.6	37.1	37.4	38.0	37.9	37.7
24	38.2	37.8	37.6	37.7	37.5	37.1	37.5	38.0	37.9	37.7
25	38.1	37.8	37.6	37.7	37.6	37.0	37.5	38.0	37.8	37.7
26	38.1	37.8	37.6	37.7	37.6	37.0	37.5	38.0	37.8	37.7
27	38.1	37.9	37.5	37.7	37.6	36.9	37.4	38.0	37.9	37.7
28	38.2	37.9	37.6	37.6	37.6	37.0	37.5	38.0	37.9	37.7
29	38.1	37.9	37.5	37.7	37.6	37.0	37.5	38.0	37.8	37.7
30	38.1	37.9	37.6	37.7	37.6	36.9	37.4	37.9	37.8	37.7
31	38.1	37.9	37.5	37.7	37.6	36.9	37.4	37.9	37.8	37.6
32	38.1	37.9	37.6		37.6	37.0	37.5	38.0	37.9	37.7
33	38.1	37.8	37.5		37.6	37.0	37.4	37.9	37.9	37.7
34	38.1	37.9	37.6		37.6	37.0	37.5	38.0	37.8	37.7
35	38.0	37.9	37.5		37.5	37.0	37.4	37.9	37.9	37.6
36	38.0	37.9	37.5		37.5	36.9	37.4	37.9	37.8	37.6
37	38.0	37.8	37.6		37.5	37.0	37.4	37.9	37.8	37.6
38	38.0	37.9	37.5		37.4	37.0	37.4	37.9	37.8	37.6
39	38.0	37.8	37.5		37.5	37.0	37.4	37.9	37.8	37.6
40	38.1	37.9	37.5	37.5	37.4	37.0	37.2	37.9	37.7	37.6
41	38.0	37.9	37.5	37.6	37.4	37.0	37.4	37.8	37.8	37.6
42	38.1	37.8	37.4	37.5	37.4	37.0	37.4	37.8	37.7	37.6
43	38.1	37.9	37.5	37.5	37.4	36.8	37.2	37.8	37.8	37.6
44	38.0	37.9	37.6	37.5	37.4	36.9	37.3	37.9	37.9	37.6

Missing data (blanks) are due to equipment malfuntion.

Table AII-1 (cont.)

Warm Condition
Rectal Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
45	38.0	37.9	37.6	37.6	37.5	36.9	37.4	37.8	37.8	37.6
46	38.1	37.8	37.6	37.6	37.4	36.9	37.3	37.8	37.8	37.6
47	38.1	37.7	37.5	37.6	37.5	36.9	37.4	37.8	37.8	37.6
48	38.0	37.7	37.6	37.6	37.5	36.9	37.4	37.8	37.8	37.6
49	38.0	37.7	37.6	37.5	37.4	37.0	37.4	37.8	37.7	37.6
50	38.0	37.7	37.6	37.5	37.4	36.9	37.3	37.8	37.8	37.6
51	38.0	37.8	37.6	37.6	37.5	37.0	37.4	37.8	37.8	37.6
52	38.0	37.7	37.5	37.5	37.4	37.0	37.3	37.9	37.8	37.6
53	38.1	37.7	37.5	37.6	37.4	36.9	37.2	37.9	37.8	37.6
54	38.0	37.8	37.4	37.4	37.3	36.9	37.3	37.9	37.7	37.5
55	38.0	37.8	37.5	37.5	37.5	37.0	37.3	37.8	37.7	37.6
56	38.0	37.8	37.5	37.5	37.4	36.9	37.3	37.8	37.7	37.5
57	38.0	37.8	37.5	37.5	37.5	37.0	37.3	37.8	37.7	37.6
58	38.0	37.8	37.4	37.5	37.5	36.9	37.4	37.8		
59	37.9	37.8	37.4	37.4	37.5	37.0	37.3	37.8		
60	38.0	37.8	37.5	37.4	37.5	37.0	37.3	37.8		
61	37.9	37.7	37.5	37.5	37.4	37.0	37.3	37.8	37.7	37.5
62	37.9	37.7	37.5	37.5	37.5	37.0	37.3	37.9	37.6	37.5
63	37.9	37.8	37.5	37.4	37.4	37.0	37.3	37.8	37.6	37.5
64	37.9	37.8	37.4	37.5	37.4	37.0	37.3	37.8	37.6	37.5
65	37.8	37.7	37.5	37.4	37.4	36.9	37.4	37.8	37.6	37.5
66	37.9	37.8	37.4	37.5	37.4	36.9	37.4	37.7	37.6	37.5
67	37.9	37.7	37.4	37.5	37.4	36.9	37.4	37.7	37.5	37.5
68	37.9	37.7	37.5	37.5	37.4	37.0	37.3	37.7	37.6	37.5
69	37.9	37.7	37.4	37.5	37.4	37.0	37.3	37.7	37.6	37.5
70	37.9	37.7	37.4	37.5	37.4	37.0	37.4	37.7	37.6	37.5
71	37.9	37.7	37.3	37.5	37.4	37.0	37.3	37.7	37.6	37.5
72	37.9	37.7	37.4	37.5	37.4	36.9	37.3	37.8	37.6	37.5
73	37.8	37.7	37.4	37.5	37.4	36.9	37.3	37.8	37.6	37.5
74	37.8	37.7	37.5	37.5	37.4	36.9	37.3	37.8	37.6	37.5
75	37.9	37.7	37.5	37.5	37.3	36.9	37.2	37.7	37.6	37.5
76	37.9	37.7	37.4	37.5	37.3	36.9	37.3	37.7	37.6	37.5
77	37.9	37.7	37.4	37.5	37.4	36.9	37.3	37.7	37.6	37.5
78	37.8	37.8	37.5	37.5	37.4	36.9	37.3	37.7	37.7	37.5
79	37.8	37.7	37.5	37.6	37.4	36.9	37.3	37.8	37.7	37.5
80	37.8	37.8	37.5	37.5	37.4	36.9	37.3	37.6	37.7	37.5
81	37.8	37.7	37.4	37.4	37.3	36.9	37.3	37.7	37.7	37.5
82	37.9	37.7	37.5	37.5	37.4	36.9	37.3	37.6	37.7	37.5
83	37.8	37.8	37.4	37.5	37.4	36.9	37.3	37.7	37.6	37.5
84	37.8	37.7	37.4	37.5	37.3	36.9	37.2	37.8	37.7	37.5
85	37.7	37.8	37.3	37.5	37.4	36.8	37.3	37.7	37.7	37.5
86	37.7	37.8	37.3	37.5	37.3	36.9	37.3	37.7	37.7	37.5
87	37.7	37.8	37.3	37.5	37.4	37.0	37.3	37.7	37.7	37.5
88	37.6	37.8	37.3	37.4	37.4	36.8	37.3	37.7	37.7	37.4
89	37.8	37.8	37.3	37.4	37.4	36.9	37.2	37.7	37.7	37.5
90	37.7	37.8	37.3	37.4	37.4	36.9	37.2	37.7	37.7	37.5

Missing data (blanks) are due to equipment malfuntion.

Table AII-1 (cont.)

Warm Condition
Rectal Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
91	37.6	37.9	37.3	37.4	37.4	36.9	37.2	37.7	37.7	37.5
92	37.6	37.8	37.4	37.4	37.3	36.8	37.2	37.7	37.6	37.4
93	37.7	37.8	37.3	37.4	37.4	36.9	37.3	37.7	37.6	37.5
94	37.6	37.9	37.3	37.4	37.4	36.9	37.2	37.7	37.6	37.4
95	37.7	37.9	37.3	37.4	37.3	36.9	37.2	37.6	37.6	37.4
96	37.6	37.8	37.3	37.4	37.3	36.8	37.2	37.7	37.7	37.4
97	37.6	37.8	37.3	37.4	37.3	36.9	37.2	37.7	37.7	37.4
98	37.6	37.7	37.4	37.3	37.4	36.9	37.2	37.7	37.7	37.4
99	37.6	37.8	37.3	37.4	37.4	36.9	37.2	37.6	37.7	37.4
100	37.6	37.8	37.4	37.4	37.3	36.8	37.2	37.6	37.7	37.4
101	37.6	37.8	37.4	37.4	37.3	36.9	37.2	37.5	37.7	37.4
102	37.6	37.7	37.4	37.4	37.3	36.8	37.2	37.6	37.6	37.4
103	37.7	37.7	37.4	37.4	37.3	36.8	37.1	37.6	37.7	37.4
104	37.5	37.7	37.4	37.4	37.3	36.8	37.1	37.6	37.7	37.4
105	37.6	37.8	37.4	37.4	37.3	36.8	37.1	37.6	37.7	37.4
106	37.6	37.8	37.4	37.4	37.3	36.8	37.2	37.6	37.7	37.4
107	37.7	37.8	37.3	37.3	37.3	36.8	37.2	37.6	37.7	37.4
108	37.6	37.8	37.3	37.5	37.4	36.8	37.1	37.6	37.7	37.4
109	37.5	37.8	37.3	37.4	37.4	36.9	37.1	37.6	37.7	37.4
110	37.6	37.8	37.3	37.4	37.4	36.9	37.1	37.6	37.7	37.4
111	37.6	37.8	37.3	37.5	37.3	36.9	37.1	37.6	37.7	37.4
112	37.6	37.8	37.3	37.3	37.4	36.8	37.1	37.6	37.7	37.4
113	37.6	37.8	37.2	37.4	37.3	36.9	37.1	37.6	37.7	37.4
114	37.6	37.8	37.3	37.3	37.4	36.8	37.1	37.5	37.7	37.4
115	37.6	37.8	37.2	37.4	37.4	36.9	37.0	37.6	37.7	37.4
116	37.6	37.8	37.2	37.4	37.3	36.9	37.0	37.6	37.7	37.4
117	37.6	37.7	37.3	37.3	37.4	37.0	37.2	37.6	37.7	37.4
118	37.6	37.8	37.2	37.3	37.3	36.9	37.1	37.5	37.7	37.4
119	37.6	37.8	37.3	37.3	37.3	36.8	37.1	37.6	37.6	37.4
120	37.6	37.7	37.3	37.4	37.3	36.9	37.1	37.6	37.7	37.4
121	37.6	37.8	37.2	37.3	37.3	36.9	37.1	37.5	37.6	37.4
122	37.6	37.7	37.3	37.3	37.3	37.0	37.1	37.5	37.7	37.4
123	37.6	37.8	37.3	37.3	37.2	36.9	37.1	37.5	37.6	37.4
124	37.6	37.8	37.3	37.3	37.2	37.0	37.1	37.6	37.6	37.4
125	37.5	37.7	37.2	37.3	37.3	36.9	37.1	37.5	37.6	37.3
126	37.5	37.8	37.3	37.4	37.2	36.8	37.1	37.5	37.6	37.4
127	37.5	37.6	37.3	37.4	37.2	36.8	37.1	37.5	37.7	37.3
128	37.5	37.7	37.3	37.4	37.2	36.8	37.1	37.5	37.6	37.3
129	37.4	37.7	37.2	37.4	37.2	36.9	37.1	37.5	37.6	37.3
130	37.5	37.7	37.2	37.3	37.2	36.9	37.1	37.5	37.5	37.3
131	37.5	37.7	37.3	37.3	37.2	36.8	37.1	37.4	37.6	37.3
132	37.4	37.7	37.4	37.4	37.1	36.9	37.1	37.5	37.6	37.3
133	37.4	37.7	37.2	37.3	37.2	36.9	37.1	37.5	37.5	37.3
134	37.4	37.7	37.4	37.4	37.2	36.8	37.1	37.5	37.6	37.3
135	37.4	37.7	37.4	37.3	37.1	36.9	37.1	37.5	37.6	37.3
136	37.4	37.8	37.4	37.3	37.1	36.8	37.1	37.4	37.6	37.3

Missing data (blanks) are due to equipment malfuntion.

Table AII-1 (cont.)

Warm Condition
Rectal Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
137	37.4	37.8	37.3	37.3	37.2	36.7	37.0	37.5	37.6	37.3
138	37.4	37.8	37.3	37.3	37.2	36.8	37.0	37.5	37.5	37.3
139	37.4	37.8	37.3	37.3	37.1	36.8	37.1	37.5	37.6	37.3
140	37.5	37.8	37.3	37.3	37.2	36.7	37.1	37.5	37.6	37.3
141	37.4	37.7	37.3	37.4	37.2	36.8	37.1	37.5	37.5	37.3
142	37.3	37.8	37.3	37.3	37.2	36.9	37.1	37.5	37.6	37.3
143	37.4	37.8	37.2	37.3	37.2	36.8	37.1	37.5	37.6	37.3
144	37.4	37.8	37.2	37.3	37.2	36.9	37.0	37.5	37.6	37.3
145	37.4	37.8	37.1	37.3	37.1	36.9	37.0	37.5	37.6	37.3
146	37.3	37.8	37.2	37.3	37.1	36.9	37.0	37.4	37.5	37.3
147	37.4	37.8	37.2	37.2	37.2	36.9	37.1	37.5	37.5	37.3
148	37.4	37.8	37.2	37.3	37.2	36.9	37.0	37.4	37.6	37.3
149	37.4	37.7	37.2	37.3	37.2	36.9	37.1	37.5	37.6	37.3
150	37.4	37.8	37.2	37.3	37.2	36.8	37.1	37.6	37.5	37.3
151	37.4	37.8	37.1	37.3	37.2	36.9	37.1	37.5	37.5	37.3
152	37.3	37.8	37.2	37.3	37.1	36.8	37.0	37.5	37.5	37.3
153	37.3	37.8	37.2	37.2	37.2	36.8	37.0	37.5	37.6	37.3
154	37.3	37.8	37.2	37.3	37.2	36.8	36.9	37.5	37.5	37.3
155	37.3	37.7	37.2	37.3	37.2	36.8	37.1	37.5	37.5	37.3
156	37.3	37.7	37.1	37.3	37.1	36.8	37.0	37.4	37.5	37.2
157	37.3	37.7	37.2	37.2	37.1	36.8	37.0	37.5	37.5	37.3
158	37.3	37.7	37.2	37.3	37.1	36.8	36.9	37.4	37.5	37.2
159	37.4	37.7	37.2	37.3	37.1	36.8	37.0	37.5	37.5	37.3
160	37.3	37.7	37.2	37.3	37.2	36.8	37.0	37.5	37.5	37.3
161	37.3	37.7	37.2	37.3	37.1	36.8	37.0	37.5	37.5	37.3
162	37.3	37.7	37.3	37.3	37.2	36.8	36.9	37.5	37.5	37.3
163	37.4	37.7	37.3	37.3	37.1	36.7	36.9	37.5	37.5	37.3
164	37.3	37.7	37.3	37.3	37.1	36.8	37.0	37.5	37.5	37.3
165	37.3	37.7	37.2	37.3	37.1	36.8	37.0	37.5	37.5	37.3
166	37.4	37.7	37.2	37.3	37.1	36.8	37.0	37.5	37.5	37.3
167	37.4	37.7	37.2	37.3	37.1	36.8	37.0	37.5	37.4	37.3
168	37.4	37.7	37.2	37.3	37.2	36.8	37.0	37.5	37.5	37.3
169	37.4	37.7	37.2	37.2	37.2	36.8	37.0	37.5	37.5	37.3
170	37.4	37.7	37.2	37.2	37.2	36.9	37.0	37.5	37.5	37.3
171	37.3	37.7	37.2	37.3	37.2	36.9	37.0	37.5	37.4	37.3
172	37.3	37.7	37.2	37.3	37.2	36.9	37.0	37.5	37.4	37.3
173	37.3	37.7	37.2	37.3	37.2	36.8	37.0	37.5	37.5	37.3
174	37.4	37.7	37.2	37.3	37.3	36.9	37.0	37.5	37.5	37.3
175	37.3	37.7	37.2		37.3	36.8	37.0	37.5	37.5	37.3
176	37.2	37.7	37.1		37.2	36.9	37.0	37.5		37.2
177	37.2	37.7	37.1		37.3	36.9	37.1	37.4		37.2
178	37.2	37.6	37.2		37.3		37.1	37.5		37.3
179	37.8	37.7	37.2		37.3		37.1	37.5		37.4

Missing data (blanks) are due to equipment malfuntion.

Table AII-1 (cont.)

Cold Condition
Rectal Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
0	37.3	37.6	37.6	38.0	38.0	38.0	37.7	37.2	38.0	37.7
1	37.4	37.7	37.6	37.9	38.1	38.1	37.6	37.3	0.0	33.5
2	37.5	37.8	37.6	38.0	38.1	38.0	37.7	37.4	0.0	33.6
3	37.5	37.8	37.6	37.9	38.1	38.1	37.6	37.5	0.0	33.6
4	37.4	37.7	37.6	37.9	38.1	38.0	37.7	37.5	0.0	33.5
5	37.4	37.7	37.6	37.9	38.0	38.0	37.6	37.5	37.9	37.7
6	37.5	37.7	37.6	37.9	38.1	37.9	37.7	37.4	0.0	33.5
7	37.5	37.6	37.6	37.8	38.1	38.0	37.6	37.4	0.0	33.5
8	37.5	37.6	37.6	37.9	38.0	38.0	37.6	37.5	0.0	33.5
9	37.5	37.6	37.6	37.9	38.0	37.9	37.6	37.5	0.0	33.5
10	37.5	37.6	37.6	37.9	38.0	38.0	37.6	37.4	37.9	37.7
11	37.6	37.6	37.5	37.8	38.0	37.8	37.7	37.4	0.0	33.5
12	37.5	37.6	37.6	37.8	38.0	37.9	37.6	37.5	0.0	33.5
13	37.6	37.6	37.6	37.8	38.0	38.0	37.6	37.5	0.0	33.5
14	37.6	37.7	37.6	37.7	38.0	38.0	37.6	37.5	0.0	33.5
15	37.6	37.7	37.6	37.9	38.0	37.9	37.7	37.5	37.9	37.8
16	37.6	37.7	37.6	37.8	37.9	37.9	37.7	37.5	0.0	33.5
17	37.6	37.8	37.6	37.8	38.0	38.0	37.6	37.4	0.0	33.5
18	37.6	37.7	37.6	37.8	38.0	37.9	37.6	37.5	0.0	33.5
19	37.7	37.8	37.7	37.7	38.0	37.9	37.6	37.5	0.0	33.5
20	37.6	37.8	37.7	37.8	38.0	37.9	37.5	37.4	37.9	37.7
21	37.7	37.9	37.7	37.8	38.0	37.9	37.6	37.4	0.0	33.6
22	37.6	38.0	37.7	37.8	38.0	37.9	37.6	37.5	0.0	33.6
23	37.6	37.9	37.6	37.8	37.9	37.9	37.7	37.5	0.0	33.5
24	37.6	37.9	37.6	37.7	38.0	37.8	37.7	37.5	0.0	33.5
25	37.7	38.0	37.6	37.7	38.0	37.8	37.7	37.5	37.7	37.7
26	37.7	37.9	37.6	37.6	37.9	37.9	37.6	37.5	0.0	33.5
27	37.7	37.9	37.7	37.6	37.9	37.9	37.7	37.5	0.0	33.5
28	37.6	37.9	37.7	37.6	37.9	37.9	37.7	37.5	0.0	33.5
29	37.7	37.9	37.7	37.7	38.0	37.9	37.6	37.4	0.0	33.5
30	37.7	37.9	37.7	37.7	37.9	37.9	37.8	37.6	37.7	37.8
31	37.7	37.8	37.7	37.7	37.9	37.9	37.7	37.5	0.0	33.5
32	37.7	37.8	37.6	37.7	37.9	37.8	37.8	37.6	0.0	33.5
33	37.8	37.7	37.7	37.7	37.9	37.8	37.7	37.6	0.0	33.5
34	37.8	37.7	37.6	37.7	37.9	37.8	37.8	37.6	0.0	33.5
35	37.8	37.9	37.6	37.6	37.9	37.8	37.8	37.6	37.6	37.7
36	37.7	37.9	37.7	37.6	37.9	37.7	37.8	37.6	0.0	33.5
37	37.6	37.8	37.6	37.6	37.8	37.8	37.8	37.5	0.0	33.5
38	37.7	37.8	37.7	37.6	37.9	37.7	37.7	37.6	0.0	33.5
39	37.6	37.8	37.6	37.5	37.9	37.8	37.8	37.6	0.0	33.5
40	37.6	37.8	37.7	37.6	37.9	37.7	37.7	37.6	37.5	37.7
41	37.7	37.8	37.7	37.6	37.8	37.8	37.8	37.6	0.0	33.5
42	37.7	37.8	37.6	37.6	37.9	37.8	37.8	37.6	0.0	33.5
43	37.7	37.8	37.5	37.6	37.8	37.8	37.7	37.5	0.0	33.5
44	37.7	37.8	37.6	37.6	37.8	37.6	37.7	37.6	0.0	33.5
45	37.6	37.7	37.7	37.5	37.8	37.7	37.7	37.6	37.5	37.6

Missing data (blanks) are due to equipment malfuntion.

Table AII-1 (cont.)

Cold Condition
Rectal Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
46	37.6	37.8	37.6	37.5	37.8	37.7	37.7	37.6	0.0	33.5
47	37.6	37.8	37.6	37.5	37.7	37.6	37.7	37.6	0.0	33.5
48	37.6	37.8	37.6	37.5	37.8	37.6	37.7	37.6	0.0	33.5
49	37.6	37.8	37.6	37.5	37.8	37.7	37.7	37.6	0.0	33.5
50	37.6	37.8	37.6	37.4	37.8	37.6	37.6	37.6	37.5	37.6
51	37.6	37.8	37.6	37.5	37.8	37.6	37.7	37.6	0.0	33.5
52	37.5	37.8	37.6	37.4	37.7	37.6	37.7	37.5	0.0	33.4
53	37.5	37.8	37.6	37.3	37.8	37.5	37.7	37.6	0.0	33.4
54	37.6	37.8	37.6	37.4	37.7	37.5	37.7	37.5	0.0	33.4
55	37.5	37.9	37.7	37.4	37.7	37.5	37.7	37.5	37.4	37.6
56	37.5	37.9	37.6	37.3	37.7	37.5	37.6	37.5	0.0	33.4
57	37.6	37.9	37.6	37.3	37.8	37.5	37.6	37.5	0.0	33.4
58	37.6	37.8	37.5	37.3	37.7	37.4	37.7	37.5	0.0	33.4
59	37.6	37.9	37.5	37.3	37.7	37.4	37.7	37.5	0.0	33.4
60	37.6	37.9	37.6	37.3	37.7	37.3	37.6	37.5	37.4	37.5
61	37.6	37.8	37.5	37.2	37.7	37.4	37.7	37.5	0.0	33.4
62	37.7	37.8	37.5	37.2	37.7	37.3	37.6	37.5	0.0	33.4
63	37.7	37.8	37.5	37.2	37.7	37.4	37.7	37.5	0.0	33.4
64	37.7	37.8	37.5	37.2	37.7	37.3	37.6	37.5	0.0	33.4
65	37.6	37.8	37.6	37.3	37.6	37.4	37.7	37.6	37.5	37.6
66	37.6	37.8	37.5	37.2	37.7	37.4	37.7	37.5	0.0	33.4
67	37.7	37.8	37.6	37.2	37.7	37.4	37.6	37.5	0.0	33.4
68	37.5	37.7	37.5	37.2	37.7	37.4	37.6	37.6	0.0	33.4
69	37.6	37.8	37.5	37.2	37.6	37.3	37.7	37.5	0.0	33.4
70	37.6	37.8	37.5	37.2	37.6	37.3	37.6	37.6	37.3	37.5
71	37.6	37.8	37.4	37.2	37.5	37.3	37.6	37.6	0.0	33.3
72	37.6	37.8	37.5	37.3	37.6	37.3	37.7	37.6	0.0	33.4
73	37.6	37.9	37.5	37.2	37.6	37.3	37.6	37.5	0.0	33.4
74	37.6	37.8	37.5	37.2	37.5	37.3	37.6	37.5	0.0	33.3
75	37.5	37.8	37.4	37.2	37.6	37.3	37.6	37.5	37.3	37.5
76	37.6	37.7	37.4	37.2	37.6	37.2	37.6	37.6	0.0	33.3
77	37.5	37.8	37.4	37.2	37.5	37.3	37.6	37.6	0.0	33.3
78	37.6	37.8	37.3	37.2	37.5	37.3	37.6	37.6	0.0	33.3
79	37.5	37.8	37.3	37.1	37.5	37.3	37.6	37.6	0.0	33.3
80	37.5	37.9	37.4	37.0	37.4	37.2	37.6	37.5	37.2	37.4
81	37.5	37.8	37.4	37.0	37.4	37.2	37.5	37.6	0.0	33.3
82	37.5	37.8	37.4	37.0	37.4	37.2	37.6	37.6	0.0	33.3
83	37.5	37.7	37.4	37.0	37.4	37.1	37.6	37.6	0.0	33.3
84	37.5	37.8	37.4	36.9	37.4	37.2	37.5	37.6	0.0	33.3
85	37.6	37.8	37.4	37.0	37.4	37.1	37.5	37.6	37.2	37.4
86	37.5	37.7	37.4	36.9	37.4	37.1	37.5	37.5	0.0	33.2
87	37.5	37.7	37.4	36.9	37.4	37.1	37.5	37.5	0.0	33.2
88	37.6	37.7	37.4	36.9	37.4	37.1	37.6	37.6	0.0	33.3
89	37.6	37.6	37.4	36.9	37.4	37.1	37.4	37.5	0.0	33.2
90	37.6	37.7	37.3	36.9	37.4	37.0	37.5	37.6	37.2	37.4
91	37.6	37.7	37.4	36.9	37.4	37.1	37.5	37.5	0.0	33.2

Missing data (blanks) are due to equipment malfuntion.

Table AII-1 (cont.)

Cold Condition
Rectal Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
92	37.5	37.7	37.3	37.0	37.4	37.1	37.5	37.6	0.0	33.2
93	37.7	37.7	37.4	37.0	37.4	37.0	37.4	37.5	0.0	33.2
94	37.6	37.7	37.4	36.9	37.4	37.1	37.5	37.6	0.0	33.2
95	37.7	37.6	37.4	36.9	37.4	37.0	37.5	37.5	37.2	37.4
96	37.6	37.6	37.4	36.9	37.4	37.1	37.4	37.5	0.0	33.2
97	37.6	37.7	37.4	37.0	37.4	37.0	37.5	37.5	0.0	33.2
98	37.6	37.7	37.3	37.0	37.4	37.0	37.5	37.6	0.0	33.2
99	37.5	37.7	37.4	37.0	37.4	37.0	37.5	37.6	0.0	33.2
100	37.6	37.7	37.4	36.9	37.4	36.9	37.5	37.5	37.1	37.3
101	37.6	37.7	37.3	36.9	37.3	36.9	37.5	37.5	0.0	33.2
102	37.6	37.6	37.4	37.0	37.4	36.9	37.5	37.5	0.0	33.2
103	37.6	37.7	37.4	36.9	37.3	37.0	37.4	37.5	0.0	33.2
104	37.6	37.6	37.4	37.0	37.3	37.0	37.4	37.6	0.0	33.2
105	37.6	37.7	37.4	36.9	37.3	37.0	37.5	37.5	37.1	37.3
106	37.6	37.7	37.3	36.9	37.4	36.9	37.5	37.5	0.0	33.2
107	37.6	37.7	37.4	36.8	37.4	36.9	37.5	37.5	0.0	33.2
108	37.6	37.6	37.3	36.8	37.3	37.0	37.4	37.5	0.0	33.2
109	37.6	37.7	37.3	36.8	37.4	37.0	37.5	37.5	0.0	33.2
110	37.5	37.7	37.3	36.7	37.4	37.0	37.5	37.4	37.1	37.3
111	37.6	37.7	37.3	36.8	37.3	37.0	37.4	37.5	0.0	33.2
112	37.5	37.6	37.3	36.7	37.3	37.0	37.5	37.5	0.0	33.2
113	37.6	37.6	37.2	36.8	37.4	37.0	37.5	37.4	0.0	33.2
114	37.5	37.8	37.2	36.7	37.4	36.9	37.5	37.3	0.0	33.1
115	37.6	37.7	37.2	36.7	37.4	37.0	37.4	37.4	37.0	37.3
116	37.6	37.7	37.2	36.8	37.4	37.0	37.4	37.5	0.0	33.2
117	37.6	37.7	37.2	36.8	37.5	36.9	37.5	37.5	0.0	33.2
118	37.6	37.7	37.2	36.8	37.4	36.9	37.4	37.5	0.0	33.2
119	37.4	37.6	37.2	36.8	37.4	36.9	37.5	37.5	0.0	33.1
120	37.5	37.7	37.2	36.8	37.4	36.9	37.6	37.5	37.0	37.3
121	37.6	37.6	37.1	36.8	37.4	36.9	37.5	37.5	0.0	33.2
122	37.6	37.6	37.1	36.8	37.5	36.8	37.5	37.5	0.0	33.2
123	37.7	37.6	37.0	36.8	37.4	36.9	37.5	37.6	0.0	33.2
124	37.7	37.6	37.0	36.9	37.5	36.9	37.5	37.5	0.0	33.2
125	37.6	37.6	37.0	36.8	37.5	36.8	37.6	37.6	37.0	37.3
126	37.6	37.6	37.0	36.8	37.5	36.9	37.5	37.6	0.0	33.2
127	37.6	37.6	37.0	36.8	37.5	36.9	37.5	37.5	0.0	33.2
128	37.6	37.6	36.7	36.8	37.5	36.8	37.5	37.5	0.0	33.1
129	37.6	37.6	36.6	36.8	37.5	36.7	37.5	37.5	0.0	33.1
130	37.6	37.6	36.6	36.7	37.5	36.7	37.5	37.6	37.0	37.2
131	37.7	37.7	36.5	36.8	37.4	36.7	37.5	37.6	0.0	33.1
132	37.7	37.7	36.3	36.8	37.4	36.8	37.4	37.6	0.0	33.1
133	37.6	37.7	36.2	36.8	37.4	36.8	37.5	37.6	0.0	33.1
134	37.5	37.7	36.0	36.8	37.4	36.8	37.5	37.5	0.0	33.0
135	37.6	37.7	36.0	36.8	37.3	36.7	37.4	37.6	36.9	37.1
136	37.6	37.7	36.0	36.8	37.4	36.7	37.5	37.6	0.0	33.0
137	37.6	37.7	36.2	36.8	37.3	36.7	37.5	37.6	0.0	33.0

Missing data (blanks) are due to equipment malfuntion.

Table AII-1 (cont.)

Cold Condition
Rectal Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
138	37.6	37.7	36.8	36.8	37.3	36.7	37.4	37.6	0.0	33.1
139	37.6	37.7	36.9	36.8	37.3	36.8	37.5	37.6	0.0	33.1
140	37.6	37.6	36.9	36.8	37.2	36.9	37.5	37.6	36.9	37.2
141	37.6	37.6	37.0	36.8	37.2	36.9	37.5	37.7	0.0	33.1
142	37.6	37.6	36.9	36.8	37.2	36.9	37.5	37.6	0.0	33.1
143	37.6	37.6	36.6	36.8	37.2	36.9	37.4	37.6	0.0	33.1
144	37.5	37.6	36.6	36.7	37.3	36.9	37.5	37.6	0.0	33.1
145	37.5	37.6	36.3	36.7	37.3	36.9	37.4	37.6	36.8	37.1
146	37.5	37.6	35.9	36.7	37.2	36.9	37.5	37.6	0.0	33.0
147	37.6	37.5	35.7	36.7	37.3	36.9	37.5	37.6	0.0	33.0
148	37.5	37.5	35.5	36.6	37.2	36.8	37.5	37.6	0.0	32.9
149	37.5	37.5	35.6	36.6	37.3	36.8	37.5	37.6	0.0	32.9
150	37.5	37.5	35.7	36.7	37.3	36.8	37.5	37.6	36.8	37.0
151	37.6	37.5	36.2	36.6	37.3	36.8	37.5	37.6	0.0	33.0
152	37.5	37.5	36.5	36.6	37.3	36.8	37.4	37.6	0.0	33.0
153	37.6	37.6	36.5	36.6	37.3	36.7	37.5	37.5	0.0	33.0
154	37.6	37.5	36.6	36.6	37.3	36.7	37.5	37.5	0.0	33.0
155	37.5	37.4	36.6	36.6	37.3	36.8	37.5	37.6	36.7	37.1
156	37.5	37.5	36.4	36.7	37.3	36.8	37.4	37.6	0.0	33.0
157	37.5	37.5	36.1	36.7	37.3	36.8	37.5	37.6	0.0	33.0
158	37.5	37.5	36.2	36.8	37.3	36.7	37.5	37.6	0.0	33.0
159	37.5	37.5	35.6	36.7	37.3	36.7	37.4	37.6	0.0	32.9
160	37.5	37.6	35.2	36.8	37.3	36.7	37.4	37.6	36.8	37.0
161	37.5	37.6	34.7	36.8	37.3	36.7	37.5	37.6	0.0	32.9
162	37.4	37.6	33.6	36.7	37.2	36.7	37.4	37.6	0.0	32.7
163	37.5	37.5	33.4	36.7	37.2	36.7	37.4	37.6	0.0	32.7
164	37.5	37.5	34.8	36.7	37.1	36.7	37.5	37.6	0.0	32.8
165	37.4	37.6	35.3	36.7	37.2	36.7	37.4	37.6	36.8	37.0
166	37.5	37.6	35.1	36.7	37.1	36.7	37.4	37.6	0.0	32.9
167	37.5	37.6	35.1	36.7	37.2	36.7	37.3	37.5	0.0	32.8
168	37.4	37.6	35.7	36.7	37.1	36.7	37.4	37.5	0.0	32.9
169	37.5	37.6	36.0	36.6	37.1	36.8	37.4	37.6	0.0	33.0
170	37.5	37.5	36.2	36.6	37.2	36.8	37.4	37.6	36.7	37.1
171	37.5	37.5	36.8	36.6	37.2	36.8	37.4	37.6	0.0	33.0
172	37.5	37.5	36.9	36.5	37.2	36.8	37.4	37.6	0.0	33.0
173	37.5	37.5	36.9	36.6	37.1	36.8	37.4	37.5	0.0	33.0
174	37.4	37.4	36.9	36.6	37.2	36.7	37.5	37.6	0.0	33.0
175	37.4	37.5	36.8	36.5	37.1	36.8	37.4	37.6	36.6	37.1
176	37.3	37.5	36.9	36.6	37.2	36.8	37.4	37.6	0.0	33.0
177	37.5	37.4	36.9	36.6	37.2	36.8	37.3	37.6	0.0	33.0
178	37.5	37.5	36.9	36.5	37.2	36.7	37.3	37.5	0.0	33.0
179	37.4	37.5	36.8	36.6	37.2	36.8	37.3	37.6	0.0	33.0
180	37.6	0.0	0.0	36.7	0.0	36.7	37.4	37.1	36.6	24.7

Missing data (blanks) are due to equipment malfuntion.

Table AII-1 (cont.)

SST Condition
Rectal Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
0	37.3	37.7	37.3	38.1	37.6	37.6	37.7	37.3		37.6
1	37.3	37.6	37.4	38.1	37.6	37.6	37.7			37.6
2	37.3	37.6	37.4	38.0	37.7	37.8	37.8			37.7
3	37.3	37.7	37.5	37.9	37.7	37.8	37.8			37.7
4	37.4	37.6	37.5	37.9	37.6	37.8	37.8			37.7
5	37.4	37.6	37.4	37.9	37.6	37.8	37.8	37.5		37.6
6	37.3	37.6	37.5	37.9	37.6	37.9	37.8			37.7
7	37.2	37.6	37.4	37.9	37.6	37.8	37.8			37.6
8	37.3	37.5	37.4	37.9	37.6	37.8	37.8			37.6
9	37.2	37.6	37.4	37.8	37.4	37.8	37.8			37.6
10	37.3	37.6	37.4	37.8	37.6	37.8	37.9	37.5		37.6
11	37.4	37.6	37.5	37.8	37.6	37.8	37.7			37.6
12	37.3	37.6	37.4	37.8	37.6	37.8	37.7			37.6
13	37.3	37.6	37.5	37.8	37.6	37.8	37.8			37.6
14	37.3	37.6	37.5	37.8	37.6	37.9	37.7			37.6
15	37.4	37.6	37.4	37.7	37.6	37.8	37.8	37.6		37.6
16	37.4	37.6	37.5	37.8	37.6	37.8	37.8			37.6
17	37.4	37.6	37.4	37.8	37.6	37.8	37.7			37.6
18	37.3	37.6	37.4	37.8	37.6	37.8	37.8			37.6
19	37.3	37.4	37.4	37.8	37.6	37.9	37.7			37.6
20	37.4	37.6	37.4	37.7	37.6	37.9	37.7	37.6		37.6
21	37.3	37.6	37.4	37.6	37.6	37.8	37.8			37.6
22	37.4	37.6	37.4	37.6	37.5	37.8	37.7			37.6
23	37.4	37.5	37.4	37.7	37.5	37.8	37.8			37.6
24	37.5	37.6	37.4	37.7	37.5	37.8	37.8			37.6
25	37.4	37.6	37.4	37.7	37.4	37.7	37.8	37.7		37.6
26	37.4	37.5	37.4	37.6	37.4	37.8	37.9			37.6
27	37.4	37.5	37.4	37.5	37.5	37.8	37.9			37.6
28	37.4	37.5	37.4	37.4	37.5	37.6	37.7			37.5
29	37.4	37.4	37.4	37.5	37.5	37.8	37.8			37.5
30	37.4	37.6	37.4	37.3	37.5	37.7	37.8	37.7		37.6
31	37.4	37.5	37.5	37.4	37.4	37.7	37.8			37.5
32	37.4	37.6	37.3	37.5	37.4	37.7	37.7			37.5
33	37.5	37.6	37.4	37.5	37.5	37.7	37.7			37.6
34	37.4	37.6	37.4	37.5	37.5	37.7	37.8			37.6
35	37.4	37.6	37.4	37.5	37.4	37.7	37.8	37.7		37.6
36	37.4	37.6	37.4	37.4	37.4	37.7	37.8			37.5
37	37.4	37.6	37.3	37.4	37.4	37.8	37.8			37.5
38	37.4	37.5	37.4	37.4	37.4	37.7	37.6			37.5
39	37.4	37.5	37.4	37.5	37.4	37.8	37.6			37.5
40	37.4	37.6	37.3	37.5	37.4	37.7	37.6	37.7		37.5
41	37.4	37.6	37.3	37.4	37.4	37.8	37.7			37.5
42	37.4	37.7	37.3	37.4	37.4	37.7	37.6			37.5
43	37.4	37.6	37.3	37.4	37.4	37.6	37.6			37.5
44	37.5	37.7	37.2	37.4	37.4	37.7	37.6			37.5
45	37.4	37.6	37.2	37.4	37.4	37.7	37.5	37.6		37.5

Missing data (blanks) are due to equipment malfuntion.

Table AII-1 (cont.)

SST Condition
Rectal Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
46	37.4	37.6	37.2	37.4	37.3	37.7	37.5			37.4
47	37.4	37.6	37.2	37.3	37.4	37.6	37.5			37.4
48	37.4	37.6	37.2	37.3	37.4	37.7	37.5			37.4
49	37.4	37.6	37.3	37.2	37.4	37.5	37.4			37.4
50	37.4	37.6	37.3	37.2	37.3	37.6	37.4	37.6		37.4
51	37.4	37.5	37.2	37.2	37.3	37.6	37.4			37.4
52	37.4	37.6	37.3	37.1	37.3	37.5	37.5			37.4
53	37.4	37.6	37.2	37.1	37.3	37.6	37.6			37.4
54	37.4	37.6	37.2	37.0	37.2	37.5	37.6			37.4
55	37.3	37.6	37.2	37.0	37.2	37.5	37.5	37.5		37.4
56	37.3	37.6	37.2	37.0	37.2	37.5	37.5			37.3
57	37.3	37.5	37.2	36.9	37.2	37.5	37.3			37.3
58	37.3	37.6	37.2	36.9	37.2	37.6	37.4			37.3
59	37.3	37.6	37.1	36.9	37.1	37.4	37.5			37.3
60	37.3	37.6	37.2	37.0	37.1	37.5	37.5	37.5		37.3
61	37.2	37.6	37.2	37.0	37.1	37.5	37.4			37.3
62	37.3	37.6	37.2	37.0	37.1	37.5	37.4			37.3
63	37.2	37.6	37.2	36.9	37.1	37.5	37.4			37.3
64	37.3	37.5	37.1	37.0	37.0	37.4	37.4			37.2
65	37.3	37.7	37.2	37.0	37.0	37.5	37.4	37.4		37.3
66	37.2	37.7	37.1	36.9	37.0	37.3	37.3			37.2
67	37.2	37.6	37.1	37.0	36.9	37.4	37.3			37.2
68	37.1	37.6	37.0	37.0	36.9	37.4	37.2			37.2
69	37.2	37.6	36.9	37.0	37.0	37.4	37.3			37.2
70	37.3	37.6	37.0	36.9	36.9	37.4	37.2	37.4		37.2
71	37.3	37.7	37.0	36.9	37.0	37.4	37.2			37.2
72	37.3	37.6	37.0	36.9	37.0	37.4	37.2			37.2
73	37.3	37.6	37.1	36.8	37.0	37.4	37.0			37.2
74	37.2	37.6	37.1	36.8	37.0	37.4	37.1			37.2
75	37.3	37.5	37.1	36.8	37.0	37.3	37.0	37.3		37.2
76	37.1	37.6	37.1	36.8	37.0	37.3	37.0			37.1
77	37.3	37.6	37.1	36.7	37.0	37.3	37.0			37.1
78	37.2	37.5	37.1	36.8	37.0	37.3	37.1			37.1
79	37.1	37.5	37.2	36.7	36.9	37.3	37.1			37.1
80	37.3	37.5	37.3	36.6	36.9	37.4	37.1	37.2		37.2
81	37.2	37.5	37.2	36.6	36.9	37.3	37.2			37.1
82	37.1	37.6	37.2	36.6	36.9	37.3	37.2			37.1
83	37.2	37.5	37.2	36.7	36.9	37.3	37.2			37.1
84	37.1	37.5	37.2	36.7	36.9	37.3	37.1			37.1
85	37.2	37.5	37.2	36.7	36.9	37.3	37.1	37.2		37.1
86	37.1	37.6	37.1	36.6	36.8	37.3	37.1			37.1
87	37.1	37.6	37.3	36.7	36.8	37.4	37.0			37.1
88	37.2	37.6	37.4	36.7	36.8	37.4	37.0			37.2
89	37.1	37.5	37.3	36.7	36.8	37.3	37.0			37.1
90	37.1	37.6	37.3	36.7	36.8	37.4	36.8	37.3		37.1
91	37.1	37.6	37.3	36.7	36.8	37.4	36.8			37.1

Missing data (blanks) are due to equipment malfuntion.

Table AII-1 (cont.)

SST Condition
Rectal Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
92	37.1	37.6	37.2	36.6	36.8	37.4	36.9			37.1
93	37.1	37.6	37.1	36.6	36.7	37.3	37.0			37.1
94	37.1	37.6	37.3	36.7	36.8	37.3	37.0			37.1
95	37.1	37.7	37.2	36.7	36.8	37.3	36.9	37.2		37.1
96	37.1	37.7	37.4	36.6	36.7	37.4	36.9			37.1
97	37.1	37.7	37.3	36.6	36.7	37.3	36.7			37.1
98	37.1	37.7	37.3	36.6	36.6	37.3	36.7			37.0
99	37.1	37.7	37.2	36.6	36.7	37.4	36.8			37.1
100	37.1	37.7	37.2	36.6	36.7	37.4	36.8	37.1		37.1
101	36.9	37.8	37.1	36.6	36.7	37.4	36.7			37.0
102	37.1	37.8	37.0	36.5	36.7	37.3	36.7			37.0
103	37.1	37.8	37.1	36.5	36.6	37.4	36.7			37.0
104	37.1	37.7	37.0	36.4	36.7	37.4	36.6			37.0
105	37.1	37.7	37.0	36.5	36.7	37.4	36.6	37.0		37.0
106	37.0	37.7	37.1	36.4	36.7	37.4	36.7			37.0
107	37.0	37.7	37.2	36.4	36.7	37.3	36.8			37.0
108	37.1	37.7	37.1	36.4	36.7	37.4	36.8			37.0
109	37.0	37.7	37.1	36.5	36.8	37.4	36.8			37.0
110	37.0	37.8	37.1	36.4	36.8	37.4	36.8	37.0		37.0
111	37.0	37.7	37.0	36.5	36.7	37.4	36.8			37.0
112	36.9	37.7	37.1	36.4	36.7	37.4	36.7			37.0
113	37.0	37.8	37.0	36.5	36.7	37.4	36.7			37.0
114	37.0	37.8	37.1	36.5	36.6	37.4	36.8			37.0
115	37.0	37.9	37.0	36.5	36.5	37.3	36.8	37.0		37.0
116	37.0	38.0	37.0	36.5	36.5	37.3	36.7			37.0
117	36.9	38.0	37.0	36.6	36.5	37.2	36.7			37.0
118	37.0	37.9	37.0	36.5	36.4	37.3	36.7			37.0
119	37.0	37.9	36.9	36.5	36.4	37.4	36.7			37.0
120	37.0	37.9	36.8	36.5	36.3	37.2	36.7	37.1		36.9
121	36.9	37.9	36.9	36.6	36.4	37.3	36.7			37.0
122	36.9	37.8	37.2	36.6	36.4	37.3	36.6			37.0
123	36.9	37.8	37.1	36.6	36.5	37.4	36.7			37.0
124	36.9	37.9	37.1	36.7	36.5	37.4	36.6			37.0
125	36.9	37.9	37.0	36.6	36.6	37.4	36.6	37.0		37.0
126	36.9	37.8	37.1	36.6	36.6	37.4	36.6			37.0
127	36.9	37.9	37.0	36.5	36.5	37.4	36.6			37.0
128	36.8	37.8	37.0	36.5	36.5	37.4	36.5			36.9
129	36.9	37.9	36.8	36.4	36.5	37.4	36.6			36.9
130	36.9	37.8	36.8	36.5	36.4	37.3	36.5	37.0		36.9
131	36.9	37.9	36.8	36.5	36.4	37.4	36.5			36.9
132	36.9	37.8	36.8	36.5	36.4	37.4	36.4			36.9
133	36.9	37.8	36.8	36.4	36.5	37.3	36.5			36.9
134	36.9	37.9	36.7	36.4	36.5	37.4	36.5			36.9
135	36.8	37.8	36.7	36.3	36.4	37.4	36.5	36.9		36.9
136	36.8	37.9	36.7	36.4	36.5	37.3	36.6			36.9
137	36.8	37.9	36.6	36.3	36.5	37.3	36.6			36.9

Missing data (blanks) are due to equipment malfuntion.

Table AII-1 (cont.)

SST Condition
Rectal Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
138	36.8	37.9	36.8	36.2	36.5	37.3	36.6			36.9
139	36.9	37.8	36.8	36.2	36.4	37.3	36.6			36.9
140	36.9	37.7	36.7	36.2	36.4	37.3	36.6	36.9		36.8
141	36.8	37.9	36.7	36.2	36.4	37.3	36.6			36.8
142	36.9	37.9	36.7	36.3	36.3	37.3	36.6			36.9
143	36.7	37.9	36.7	36.2	36.3	37.3	36.6			36.8
144	36.9	37.9	36.6	36.3	36.3	37.3	36.5			36.8
145	36.8	37.9	36.7	36.4	36.2	37.3	36.5	36.8		36.8
146	36.8	38.0	36.6	36.3	36.2	37.2	36.5			36.8
147	36.8	37.8	36.7	36.3	36.3	37.3	36.5			36.8
148	36.8	37.9	36.8	36.4	36.3	37.4	36.5			36.9
149	36.8	37.9	36.8	36.4	36.3	37.3	36.5			36.9
150	36.8	37.9	36.8	36.4	36.3	37.4	36.5	36.9		36.9
151	36.9	37.9	36.8	36.4	36.3	37.4	36.6			36.9
152	36.8	37.8	36.8	36.4	36.3	37.3	36.4			36.8
153	36.9	37.9	36.8	36.5	36.3	37.4	36.5			36.9
154	36.8	37.8	36.8	36.4	36.3	37.3	36.4			36.8
155	36.8	37.8	36.9	36.4	36.2	37.3	36.5	36.9		36.9
156	36.8	37.8	36.8	36.4	36.2	37.3	36.4			36.8
157	36.7	37.9	36.8	36.4	36.2	37.3	36.4			36.8
158	36.7	37.9	36.6	36.3	36.3	37.3	36.5			36.8
159	36.8	37.9	36.5	36.3	36.3	37.3	36.4			36.8
160	36.8	37.9	36.5	36.3	36.3	37.3	36.4	36.8		36.8
161	36.8	37.9	36.6	36.3	36.3	37.3	36.4			36.8
162	36.8	37.9	36.6	36.2	36.3	37.4	36.4			36.8
163	36.8	37.9	36.6	36.2	36.3	37.4	36.3			36.8
164	36.8	37.9	36.5	36.2	36.3	37.4	36.4			36.8
165	36.7	37.9	36.6	36.2	36.3	37.3	36.4	36.8		36.8
166	36.8	37.9	36.6	36.2	36.4	37.4	36.5			36.8
167	36.8	37.9	36.5	36.2	36.4	37.2	36.5			36.8
168	36.8	37.9	36.2	36.0	36.3	37.3	36.5			36.7
169	36.8	37.9	36.3	36.0	36.2	37.4	36.4			36.7
170	36.7	37.9	36.3	36.1	36.2	37.3	36.5	36.7		36.7
171	36.8	37.9	36.5	36.0	36.0	37.3	36.4			36.7
172	36.8	37.9	36.6	36.0	36.0	37.3	36.5			36.7
173	36.7	37.8	36.7	36.0	36.1	37.2	36.5			36.7
174	36.8	38.0	36.6		36.0	37.3	36.4			36 9
175	36.8	38.0	36.7	36.0	36.0	37.3	36.4	36.6		36.7
176	37.7	38.0	36.5		36.0	37.3	36.5			37.0
177	37.6	38.0	36.6		36.0	37.2	36.5			37.0
178	37.6	38.0	36.7		36.1	37.2	36.4			37.0
179	37.7	38.0			36.2	37.2	36.4			37.1
180	37.6	38.0			36.3			36.7		19.2

Missing data (blanks) are due to equipment malfuntion.

Table AII-2

Warm Condition
Mean Skin Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
0	32.6	34.1	32.5	33.4	32.7	33.0		33.3	32.5	33.0
1	32.6	34.0	32.5	33.4	32.9	33.0		33.3	32.5	33.0
2	32.7	34.1	32.6	33.4	33.0	32.9		33.4	32.4	33.1
3	32.6	34.1	32.8	33.5	33.0	32.8		33.4	32.6	33.1
4	32.6	34.1	32.8	33.5	33.1	32.8		33.4	32.7	33.1
5	32.5	34.1	32.9	33.5	33.4	32.7		33.2	32.9	33.2
6	32.6	34.2	32.9	33.5	33.4	33.0		33.2	32.9	33.2
7	32.7	34.1	32.8	33.4	33.4	33.2		33.3	32.9	33.2
8	32.5	34.1	32.7	33.3	33.7	33.2		33.3	33.2	33.3
9	32.3	34.1	32.6	33.4	33.5	33.2		33.4	33.0	33.2
10	32.4	33.9	32.5	33.4	33.6	32.9		33.5	32.9	33.1
11	32.1	33.9	32.6	33.3	33.4	32.9		33.5	33.0	33.1
12	32.1	33.9	32.5	33.2	33.4	32.9		33.4	33.2	33.1
13	32.2	33.9	32.6	33.3	33.3	32.7		33.4	33.7	33.1
14	32.4	33.9	32.8	33.1	33.3	32.8		33.2	33.7	33.2
15	32.5	34.0	32.7	33.1	33.1	32.8		33.3	33.6	33.1
16	32.5	34.1	32.6	33.2	33.3	32.8		33.4	33.5	33.2
17	32.2	34.1	32.5	33.1	33.4	32.8		33.3	33.6	33.1
18	32.3	34.1	32.2	33.3	33.4	32.7		33.3	33.2	33.1
19	32.2	34.0	32.2	33.2	33.4	32.8		33.4	33.1	33.0
20	32.0	34.0	32.5	33.2	33.6	32.7		33.4	32.6	33.0
21	32.1	34.0	32.7	33.3	33.5	32.5		33.3	32.9	33.0
22	32.3	34.0	32.8	33.4	33.4	32.5		33.3	33.3	33.1
23	32.5	34.0	32.8	33.3	33.3	32.4		33.3	33.3	33.1
24	32.4	34.1	32.9	33.3	33.4	32.4		33.4	33.2	33.1
25	32.3	34.0	32.8	33.4	33.4	32.5		33.4	33.2	33.1
26	32.0	34.1	32.5	33.5	33.4	32.6		33.3	33.1	33.1
27	31.9	34.1	32.6	33.4	33.4	33.1		33.2	32.9	33.1
28	31.4	33.9	32.6	33.4	33.4	32.6		33.1	32.0	32.8
29	31.5	33.8	32.6	33.3	33.4	32.5		33.0	31.6	32.7
30	31.1	33.8	32.5	33.2	33.2	32.4		32.8	31.7	32.6
31	31.4	33.8	32.7	33.2	33.1	32.3		32.8	31.8	32.6
32	31.6	33.9	32.9	33.1	33.3	32.4		32.9	32.0	32.8
33	31.6	34.0	33.0	33.1	33.3	32.5		33.0	32.1	32.8
34	31.4	34.0	33.1	33.2	33.4	32.5		33.0	32.4	32.9
35	31.5	34.0	33.2	33.2	33.5	32.6		33.0	32.4	32.9
36	31.1	34.0	32.8	33.2	33.4	32.7		32.9	32.4	32.8
37	31.2	34.0	32.7	33.1	33.4	32.7		32.9	31.9	32.7
38	30.9	33.8	32.7	33.1	33.3	32.8		32.9	31.6	32.6
39	31.3	33.8	32.7	33.1	33.2	32.9		32.8	31.9	32.7
40	31.6	33.8	32.9	33.0	33.2	32.6		32.8	31.9	32.7
41	31.5	33.9	32.9	33.0	33.2	32.6		32.9	31.9	32.7
42	31.7	34.0	32.9	33.0	33.0	32.6		33.0	32.1	32.8
43	31.4	34.0	32.8	33.0	33.2	32.6		33.1	32.0	32.8
44	31.2	34.0	32.8	32.9	33.2	32.7		33.1	31.9	32.7

Missing data (blanks) are due to equipment malfuntion.

Table AII-2 (cont.)

Warm Condition
Mean SkinTemperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
45	31.4	33.9	32.5	32.9	33.2	32.7		33.0	31.8	32.7
46	31.4	33.8	32.4	33.1	33.3	32.8		32.9	31.9	32.7
47	31.5	33.8	32.6	33.1	33.2	32.6		32.8	31.9	32.7
48	31.8	33.8	32.6	33.3	33.1	32.5		32.8	32.1	32.8
49	31.8	33.9	32.6	33.3	33.2	32.5		32.8	32.0	32.8
50	31.8	33.9	32.6	33.3	33.4	32.5		32.9	31.9	32.8
51	31.3	33.9	32.6	33.3	33.5	32.5		32.9	31.9	32.7
52	31.3	33.9	32.6	33.3	33.5	32.6		32.9	31.6	32.7
53	31.2	34.0	32.4	33.3	33.4	32.5		32.9	31.5	32.7
54	31.1	33.9	32.1	33.3	33.4	32.5		32.8	31.5	32.6
55	30.8	33.8	32.3	33.3	33.4	32.5		32.8	31.4	32.5
56	31.1	33.7	32.7	33.3	33.3	32.4		32.8	31.5	32.6
57	31.5	33.7	33.0	33.3	33.2	32.3		32.8	31.5	32.7
58	31.6	33.8	33.1	33.3	33.2	32.3		32.8	31.5	32.7
59	31.5	33.9	33.1	33.2	33.2	32.3		32.8	31.5	32.7
60	31.2	34.0	33.1	33.1	33.3	32.4		32.8	31.6	32.7
61	31.4	34.0	33.0	33.0	33.2	32.5		32.9	31.7	32.7
62	31.5	34.0	32.9	32.9	33.3	32.5		32.9	31.6	32.7
63	31.3	34.0	32.8	33.0	33.1	32.4		32.9	31.8	32.7
64	30.8	34.0	32.8	33.1	33.1	32.3		32.8	31.7	32.6
65	30.7	34.0	32.8	33.2	33.0	32.3		32.8	31.7	32.6
66	31.1	34.0	33.0	33.2	33.0	32.5		32.8	31.7	32.7
67	31.2	34.0	33.1	33.1	33.2	32.6		32.8	31.0	32.6
68	30.9	34.0	33.2	33.1	33.2	32.4		32.9	30.5	32.5
69	30.6	34.0	32.9	33.0	33.1	32.4		32.8	31.5	32.5
70	30.6	33.9	32.7	33.0	33.0	32.5		32.8	31.5	32.5
71	31.1	33.9	32.7	33.1	33.0	32.5		32.8	31.7	32.6
72	31.1	33.9	32.6	33.1	32.9	32.4		32.8	31.8	32.6
73	31.0	33.8	32.6	33.1	32.7	32.4		32.9	31.8	32.5
74	30.9	33.8	32.6	33.1	32.6	32.3		32.8	31.7	32.5
75	30.9	33.8	32.7	33.1	32.6	32.3		32.8	31.8	32.5
76	31.3	33.9	32.8	33.1	32.8	32.2		32.8	31.9	32.6
77	31.4	34.0	32.8	33.2	32.8	32.2		32.8	31.9	32.6
78	31.2	34.0	32.7	33.3	33.0	32.2		32.9	31.9	32.7
79	30.8	33.9	32.6	33.3	33.1	32.3		32.7	31.9	32.6
80	30.8	33.9	32.3	33.4	33.1	32.3		32.8	31.9	32.6
81	30.7	33.9	32.1	33.5	32.9	32.3		32.8	31.7	32.5
82	31.0	33.8	32.2	33.5	32.9	32.2		32.8	31.7	32.5
83	31.1	33.8	32.3	33.5	32.9	32.1		32.7	31.6	32.5
84	31.4	33.8	32.5	33.4	32.8	32.1		32.9	27.4	32.0
85	31.4	33.9	32.5	33.4	32.9	32.0		32.9	30.4	32.4
86	31.3	34.0	32.5	33.3	32.8	32.1		32.9	30.5	32.4
87	31.3	34.1	32.3	33.2	32.8	32.2		32.9	30.9	32.5
88	30.9	34.1	32.1	33.3	32.8	32.3		32.9	29.4	32.2
89	30.6	34.0	32.0	33.4	32.9	32.3		32.9	30.2	32.3
90	30.6	33.9	32.0	33.4	32.9	32.3		32.8	30.2	32.3

Missing data (blanks) are due to equipment malfuntion.

Table AII-2 (cont.)

Warm Condition
Mean SkinTemperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
91	30.8	33.8	32.1	33.4	32.8	32.2		32.6	26.8	31.8
92	31.0	33.8	32.4	33.3	32.8	32.2		32.6	30.5	32.3
93	30.9	33.8	32.5	33.2	32.8	32.1		32.7	31.6	32.5
94	30.9	34.0	32.5	33.1	32.8	32.1		32.8	30.2	32.3
95	30.9	34.1	32.5	33.1	32.8	32.1		32.8	30.2	32.3
96	30.7	34.1	32.3	33.2	32.9	32.3		32.8	31.6	32.5
97	30.3	34.0	32.3	33.3	33.0	32.3		32.7	31.5	32.4
98	30.3	33.9	32.1	33.3	32.9	32.3		32.6	31.8	32.4
99	30.4	33.8	32.2	33.4	32.9	32.2		32.6	31.9	32.4
100	30.9	33.7	32.4	33.3	32.8	32.1		32.5	31.6	32.4
101	31.2	33.7	32.5	33.3	32.7	32.1		32.4	31.8	32.5
102	30.9	33.7	32.6	33.2	32.7	32.1		32.6	32.0	32.5
103	31.1	33.8	32.5	33.2	32.6	32.1		32.7	31.9	32.5
104	31.0	33.9	32.5	33.3	32.9	32.1		32.6	32.0	32.5
105	30.9	33.9	32.4	33.3	32.9	32.1		32.6	31.6	32.5
106	30.9	33.8	32.3	33.4	33.0	32.1		32.7		32.6
107	30.6	33.7	32.2	33.4	32.9	32.1		32.5		32.5
108	30.9	33.7	32.3	33.3	32.9	32.1		32.4		32.5
109	30.9	33.7	32.1	33.2	32.8	32.1		32.5		32.5
110	31.0	33.7	32.3	33.2	32.6	32.1		32.6		32.5
111	31.2	33.8	32.3	33.1	32.6	32.1		32.7		32.5
112	30.8	33.7	32.3	33.1	32.7	32.1		32.7		32.5
113	30.8	33.8	32.5	33.1	32.8	32.2		32.8		32.6
114	30.9	33.8	32.5	33.1	32.9	32.2		32.8		32.6
115	31.0	33.8	32.2	33.1	32.9	32.2		32.7		32.6
116	30.9	33.8	32.0	33.2	32.9	32.2		32.7		32.5
117	30.8	33.8	31.9	33.2	33.0	32.2		32.7		32.5
118	31.1	33.7	32.0	33.3	33.0	32.0		32.7		32.5
119	31.2	33.7	32.1	33.3	33.0	31.9		32.7		32.6
120	31.2	33.7	32.2	33.3	33.0	31.8		32.8		32.6
121	30.8	33.8	32.2	33.1	33.1	31.9		32.8		32.5
122	30.6	33.9	32.3	33.0	33.1	31.9		32.7		32.5
123	30.6	34.0	32.2	33.1	33.2	31.9		32.7		32.5
124	30.4	33.8	32.1	33.1	33.2	31.9		32.6		32.4
125	30.3	33.8	32.0	33.1	33.2	32.0		32.5		32.4
126	30.1	33.6	32.1	33.2	33.0	31.9		32.5		32.3
127	30.3	33.6	32.3	33.1	33.0	32.0		32.4		32.4
128	30.4	33.6	32.3	33.1	32.9	31.9		32.5		32.4
129	31.1	33.7	32.4	33.1	32.8	31.9		32.5		32.5
130	31.1	33.7	32.3	33.1	32.9	31.9		32.5		32.5
131	30.9	33.8	32.2	33.2	32.9	31.9		32.5		32.5
132	30.6	33.8	32.2	33.3	33.0	31.9		32.5		32.5
133	30.6	33.7	32.0	33.3	33.0	31.9		32.5		32.4
134	30.2	33.7	31.9	33.3	32.9	31.9		32.4		32.3
135	30.4	33.8	32.0	33.3	32.8	31.9		32.3		32.4
136	30.9	33.7	32.2	33.2	32.8	31.8		32.4		32.4

Missing data (blanks) are due to equipment malfuntion.

Table AII-2 (cont.)

Warm Condition
Mean SkinTemperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
137	31.1	33.8	32.3	33.1	32.8	31.7		32.5		32.5
138	31.0	33.9	32.3	33.0	32.8	31.7		32.4		32.4
139	31.1	33.9	32.2	33.1	32.9	31.7		32.5		32.5
140	31.1	34.0	32.1	33.1	33.0	31.7		32.5		32.5
141	31.0	34.0	31.8	33.2	33.1	31.8		32.4		32.5
142	30.9	33.9	31.7	33.2	33.1	31.8		32.3		32.4
143	30.9	33.9	31.7	33.2	33.0	31.8		32.4		32.4
144	30.8	33.8	31.8	33.1	33.0	31.8		32.3		32.4
145	31.0	33.7	31.9	33.1	32.9	31.8		32.3		32.4
146	31.1	33.7	32.1	33.0	32.8	31.6		32.4		32.4
147	31.1	33.8	32.2	33.1	32.8	31.6		32.5		32.4
148	31.1	33.7	32.2	33.1	32.8	31.6		32.5		32.4
149	30.9	33.8	31.9	33.1	33.0	31.7		32.5		32.4
150	30.9	33.9	31.7	33.1	33.1	31.9		32.4		32.4
151	30.7	33.8	31.7	33.1	33.0	31.9		32.3	31.4	32.2
152	30.8	33.7	31.7	33.1	33.0	31.9		32.4	31.3	32.2
153	30.9	33.7	31.8	33.0	33.0	32.0		32.4	31.4	32.3
154	30.7	33.6	32.0	33.0	32.9	31.9		32.5	32.0	32.3
155	30.9	33.7	32.0	33.1	32.8	31.9		32.4	31.0	32.2
156	30.8	33.6	32.1	33.0	32.8	31.8		32.4	30.9	32.2
157	30.5	33.7	32.1	33.1	32.8	31.8		32.4	32.1	32.3
158	30.2	33.7	32.0	33.2	32.9	31.9		32.4	32.1	32.3
159	30.4	33.7	31.9	33.2	32.9	31.9		32.3	32.0	32.3
160	30.4	33.7	31.8	33.3	32.8	31.9		32.4	32.2	32.3
161	30.3	33.6	31.8	33.3	32.8	31.8		32.5		32.3
162	30.6	33.5	31.9	33.2	32.7	31.9		32.7		32.4
163	30.7	33.5	32.1	33.1	32.7	31.9		32.6		32.4
164	30.7	33.6	32.2	33.2	32.7	32.0		32.5		32.4
165	30.7	33.6	32.1	33.2	32.8	32.1		32.2		32.4
166	30.4	33.6	32.1	33.3	32.9	32.1		32.4		32.4
167	30.6	33.7	31.9	33.3	33.0	32.2		32.2	32.0	32.4
168	30.8	33.8	31.8	33.2	33.1	32.3		32.2		32.5
169	30.9	33.8	31.8	33.2	33.0	32.3		32.4	32.1	32.4
170	31.0	33.7	31.9	33.1	33.0	32.4		32.4		32.5
171	31.0	33.7	31.7	33.0	33.0	32.3		32.6		32.5
172	31.1	33.5	32.0	33.0	32.9	32.2		32.5		32.5
173	31.2	33.5	32.3	33.1	32.9	32.1		32.5		32.5
174	31.0	33.7	32.2	33.1	33.0	32.1		32.4		32.5
175	31.0	33.7	32.2		33.1	32.2		32.5	32.3	32.4
176	30.5	33.8	32.2		33.2	32.2		32.6		32.4
177	30.4	33.7	32.2		33.2	31.7		32.6		32.3
178	30.7	33.8	32.0		33.2			32.6		32.5
179	34.1	33.8	31.9		33.1			32.8		33.1

Missing data (blanks) are due to equipment malfuntion.

Table AII-2 (cont.)

Cold Condition
Mean SkinTemperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
0	33.2	33.1	33.6	33.0	34.8	33.0	33.8	34.0	33.3	33.5
1	32.7	33.0	33.1	32.1	34.8	32.9	33.6	34.0	0.0	29.6
2	32.4	32.5	31.9	29.8	34.3	32.4	33.0	33.5	0.0	28.9
3	32.2	31.9	31.0	29.2	33.5	31.8	32.7	33.1	0.0	28.4
4	31.8	31.2	30.6	28.7	32.7	31.4	32.3	32.7	0.0	27.9
5	31.2	30.7	30.8	28.3	32.2	31.0	32.0	32.3	31.4	31.1
6	30.7	30.3	30.5	27.9	32.1	30.6	31.8	31.8	0.0	27.3
7	30.4	29.8	30.1	27.3	31.9	30.3	31.3	31.6	0.0	27.0
8	29.7	29.6	29.5	26.6	31.3	29.8	31.0	31.4	0.0	26.5
9	29.5	29.4	29.3	26.3	31.0	29.4	30.8	31.2	0.0	26.3
10	29.6	29.2	29.0	26.1	30.5	29.1	30.5	31.0	30.1	29.5
11	28.8	29.1	29.2	25.9	30.8	28.7	30.4	30.9	0.0	26.0
12	28.1	29.0	29.3	25.7	31.0	28.5	30.3	30.7	0.0	25.8
13	28.1	28.9	29.6	25.7	31.0	28.3	30.2	30.6	0.0	25.8
14	28.0	28.8	29.0	25.6	30.9	28.4	30.0	30.4	0.0	25.7
15	28.2	28.7	28.7	25.6	30.4	28.2	29.5	30.4	29.4	28.8
16	28.0	28.6	28.6	25.4	30.3	27.9	29.8	30.2	0.0	25.4
17	27.3	28.6	28.6	25.4	30.4	28.1	29.7	30.2	0.0	25.4
18	27.9	28.5	29.1	25.2	30.5	27.9	29.5	30.0	0.0	25.4
19	27.4	28.2	29.3	25.2	30.5	27.9	29.6	29.9	0.0	25.3
20	27.5	28.2	29.2	25.5	30.3	27.9	29.5	29.7	29.1	28.5
21	27.1	28.2	28.9	25.2	29.9	27.8	29.6	29.6	0.0	25.1
22	26.9	28.2	28.8	24.9	29.6	27.8	29.6	29.6	0.0	25.0
23	26.7	28.2	28.7	25.1	29.6	27.8	29.5	29.5	0.0	25.0
24	26.3	28.2	28.7	25.7	29.5	27.6	29.5	29.2	0.0	25.0
25	26.2	28.2	28.7	25.8	29.7	27.5	29.3	29.1	29.1	28.2
26	26.2	28.1	28.6	25.8	29.9	27.6	29.2	29.0	0.0	24.9
27	26.2	28.1	28.6	25.8	29.6	27.6	29.2	29.1	0.0	24.9
28	26.1	28.1	28.6	26.2	29.3	27.7	29.1	29.0	0.0	24.9
29	25.6	28.2	28.6	26.2	29.5	27.6	29.0	28.9	0.0	24.8
30	25.9	28.2	28.8	26.1	29.1	27.4	28.9	28.8	28.8	28.0
31	26.5	28.1	28.7	26.0	28.9	27.4	28.8	29.0	0.0	24.8
32	27.1	28.0	27.7	25.9	29.3	27.3	29.0	29.3	0.0	24.8
33	26.8	28.0	27.4	25.9	29.1	27.4	29.1	29.4	0.0	24.8
34	27.3	27.9	27.5	25.9	28.9	27.4	29.0	29.5	0.0	24.8
35	26.9	27.9	27.2	26.1	28.8	27.3	28.9	29.4	29.1	28.0
36	27.2	27.9	27.2	25.6	28.8	26.8	28.7	29.3	0.0	24.6
37	27.3	27.8	26.9	25.5	29.0	26.3	28.7	29.1	0.0	24.5
38	27.2	27.8	26.7	25.2	29.1	26.2	28.7	29.0	0.0	24.4
39	27.1	27.7	26.6	25.2	29.1	25.9	28.8	29.0	0.0	24.4
40	27.3	27.6	26.5	25.0	28.8	26.1	28.9	29.1	27.8	27.5
41	27.5	27.5	26.5	25.1	28.4	26.4	28.8	29.0	0.0	24.4
42	27.1	27.5	27.3	25.2	25.7	26.1	28.8	29.0	0.0	24.1
43	26.6	27.2	27.3	25.7	28.8	25.8	28.7	29.0	0.0	24.3
44	26.7	27.1	26.8	24.7	28.8	25.8	28.8	29.0	0.0	24.2
45	26.8	27.0	26.8	24.0	28.8	25.9	28.8	29.1	28.0	27.2

Missing data (blanks) are due to equipment malfuntion.

Table AII-2 (cont.)

Cold Condition
Mean SkinTemperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
46	26.4	27.0	26.8	23.7	28.6	25.9	28.6	29.1	0.0	24.0
47	26.1	26.9	27.1	23.6	28.4	26.0	28.2	29.0	0.0	23.9
48	25.7	26.8	27.4	23.7	28.4	26.0	28.3	28.9	0.0	23.9
49	25.7	26.8	27.7	23.7	28.6	26.0	28.5	29.0	0.0	24.0
50	25.4	26.9	27.7	23.5	28.3	26.1	28.7	28.9	28.7	27.1
51	25.4	27.0	27.5	23.4	27.8	26.1	28.6	29.0	0.0	23.9
52	25.4	27.0	27.3	23.5	28.0	26.2	28.5	28.9	0.0	23.9
53	25.4	27.0	27.3	23.3	27.5	26.2	28.6	28.8	0.0	23.8
54	25.6	26.9	27.8	23.0	27.7	26.1	28.7	28.7	0.0	23.8
55	25.9	26.9	28.0	23.6	27.9	26.0	28.7	28.5	28.9	27.2
56	26.1	27.1	28.3	25.1	27.8	25.9	28.7	28.4	0.0	24.2
57	26.3	27.3	28.2	25.4	27.8	26.0	28.6	28.3	0.0	24.2
58	26.5	27.3	28.1	24.6	28.0	26.1	28.7	28.1	0.0	24.2
59	26.4	27.3	27.7	24.2	28.1	26.1	28.6	28.1	0.0	24.1
60	26.4	27.2	27.7	24.4	27.9	26.0	28.7	28.1	28.8	27.2
61	27.2	27.1	27.8	24.5	27.9	25.9	28.8	28.1	0.0	24.1
62	26.7	27.1	27.8	24.6	27.9	25.9	28.9	27.9	0.0	24.1
63	27.1	27.1	27.5	24.6	27.4	25.8	29.1	27.9	0.0	24.1
64	26.8	27.1	27.1	24.8	27.6	25.7	29.3	28.1	0.0	24.1
65	26.9	27.1	27.2	25.0	27.8	25.8	29.0	27.9	28.4	27.2
66	26.9	27.1	27.2	24.9	27.2	25.9	28.8	27.8	0.0	24.0
67	26.6	26.9	26.7	24.9	26.2	25.9	28.5	27.7	0.0	23.7
68	26.6	26.9	26.6	24.4	25.8	25.4	28.6	27.7	0.0	23.6
69	26.9	26.8	26.3	24.5	26.2	25.0	28.7	27.7	0.0	23.6
70	27.2	26.7	26.6	24.5	26.1	24.9	28.8	28.2	27.8	26.8
71	27.2	26.7	26.8	23.9	26.8	24.6	28.9	28.4	0.0	23.7
72	26.8	26.6	26.8	23.4	27.6	25.1	28.6	28.3	0.0	23.7
73	26.7	26.6	26.3	23.3	27.4	25.2	28.7	28.1	0.0	23.6
74	26.9	26.5	26.7	23.5	27.5	24.8	28.6	28.4	0.0	23.7
75	26.9	26.5	26.4	23.4	27.6	24.5	28.6	28.5	28.2	26.7
76	26.3	26.5	26.5	23.2	27.4	24.6	28.6	28.5	0.0	23.5
77	26.3	26.6	27.5	23.3	27.1	24.7	28.4	28.4	0.0	23.6
78	26.2	26.6	27.9	23.1	26.6	25.0	28.2	28.1	0.0	23.5
79	26.5	26.7	27.7	23.0	26.6	25.1	28.3	28.0	0.0	23.5
80	26.7	26.7	27.4	22.5	27.2	25.2	27.9	28.4	28.1	26.7
81	26.5	26.8	28.0	23.0	27.1	25.3	28.4	28.3	0.0	23.7
82	26.1	26.8	27.8	23.7	27.3	25.3	28.4	28.3	0.0	23.7
83	26.3	26.7	27.6	24.3	27.1	25.5	28.5	28.4	0.0	23.8
84	26.4	26.7	27.6	24.3	26.8	25.4	28.5	28.2	0.0	23.8
85	26.1	26.7	27.4	24.3	27.1	25.3	28.3	28.4	28.8	26.9
86	26.7	26.7	27.5	24.3	27.0	25.2	28.3	28.2	0.0	23.8
87	26.9	26.7	27.8	24.4	27.2	25.1	28.1	28.1	0.0	23.8
88	26.6	26.6	27.6	24.7	27.1	25.0	28.1	28.0	0.0	23.7
89	26.3	26.5	27.8	24.7	27.0	25.0	28.0	28.1	0.0	23.7
90	26.2	26.5	28.1	24.6	26.9	25.0	27.9	28.0	28.6	26.9
91	26.3	26.6	28.0	24.6	27.2	24.9	28.4	28.2	0.0	23.8

Missing data (blanks) are due to equipment malfuntion.

Table AII-2 (cont.)

Cold Condition
Mean SkinTemperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
92	26.6	26.7	27.9	24.5	27.1	25.0	28.5	28.3	0.0	23.8
93	26.9	26.8	28.1	24.2	27.1	24.9	28.6	28.4	0.0	23.9
94	26.4	26.8	27.6	24.0	27.3	25.1	28.7	28.5	0.0	23.8
95	26.5	26.7	27.3	24.0	27.2	25.1	29.1	28.5	28.6	27.0
96	27.0	26.7	27.0	24.0	27.1	25.2	28.8	28.6	0.0	23.8
97	26.8	26.6	27.2	23.6	26.8	25.2	29.0	28.5	0.0	23.7
98	26.7	26.4	27.1	23.6	26.8	25.2	28.6	28.5	0.0	23.7
99	27.0	26.4	26.8	23.5	26.7	24.8	28.7	28.5	0.0	23.6
100	27.3	26.4	26.6	23.4	27.0	24.7	28.6	28.5	28.1	26.7
101	27.1	26.4	26.7	23.4	27.1	24.5	28.6	28.5	0.0	23.6
102	27.0	26.4	27.0	23.1	26.9	24.6	28.6	28.5	0.0	23.6
103	27.2	26.4	27.3	23.0	26.5	24.7	28.3	28.5	0.0	23.5
104	26.7	26.5	27.1	23.1	26.9	24.2	27.9	28.5	0.0	23.4
105	26.4	26.4	26.7	23.0	26.4	24.2	28.1	28.5	28.1	26.4
106	26.4	26.4	26.7	23.5	26.4	24.2	28.1	28.4	0.0	23.3
107	26.4	26.4	26.6	24.2	26.9	24.5	28.4	28.4	0.0	23.5
108	26.9	26.4	27.4	24.1	27.2	24.4	28.6	28.2	0.0	23.7
109	26.8	26.4	27.7	23.9	27.0	24.2	28.6	28.4	0.0	23.7
110	27.1	26.3	27.5	24.2	26.9	24.4	28.6	28.2	28.7	26.9
111	26.4	26.3	27.8	24.5	26.8	24.7	28.6	28.1	0.0	23.7
112	26.1	26.3	27.7	24.7	26.7	24.8	28.5	28.0	0.0	23.6
113	26.2	26.4	27.4	24.7	26.8	24.8	28.5	27.9	0.0	23.6
114	26.3	26.5	27.7	24.7	26.8	24.9	28.6	27.7	0.0	23.7
115	25.8	26.5	27.3	24.6	26.8	25.0	28.7	27.7	28.7	26.8
116	25.7	26.5	27.5	24.5	26.9	25.1	28.8	27.6	0.0	23.6
117	26.1	26.6	27.7	24.4	26.8	25.2	28.9	27.4	0.0	23.7
118	26.3	26.6	27.2	24.6	26.8	25.4	29.0	27.5	0.0	23.7
119	26.1	26.6	26.9	24.9	26.9	25.2	29.0	27.5	0.0	23.7
120	26.0	26.6	27.1	24.9	26.7	25.0	29.0	27.4	29.0	26.9
121	26.8	26.7	27.8	24.6	27.0	25.1	28.9	27.5	0.0	23.8
122	26.7	26.7	27.4	24.3	27.2	25.2	28.9	27.6	0.0	23.8
123	26.9	26.7	27.2	24.8	27.0	25.2	28.8	27.8	0.0	23.8
124	26.3	26.8	27.2	24.4	26.7	25.0	28.9	28.1	0.0	23.7
125	26.3	26.8	26.9	24.2	26.8	25.2	28.9	28.2	28.5	26.9
126	26.3	26.7	26.7	24.0	27.0	25.2	28.6	28.1	0.0	23.6
127	26.6	26.7	26.4	24.1	26.6	25.2	28.2	27.8	0.0	23.5
128	26.8	26.7	26.4	24.4	26.4	24.7	28.1	27.6	0.0	23.5
129	26.9	26.7	26.3	24.4	26.4	24.4	28.2	27.9	0.0	23.5
130	26.8	26.6	26.2	24.3	26.6	24.2	28.2	28.2	27.8	26.5
131	27.0	26.6	26.6	24.3	26.8	24.1	28.4	28.2	0.0	23.6
132	26.5	26.6	26.6	24.7	26.7	24.7	28.5	28.3	0.0	23.6
133	26.5	26.5	26.7	25.0	26.3	24.5	28.0	28.4	0.0	23.5
134	26.9	26.4	26.3	24.4	26.3	24.1	28.1	28.4	0.0	23.4
135	27.1	26.3	26.6	24.5	26.3	24.1	28.1	28.4	27.6	26.6
136	26.6	26.2	26.5	24.5	25.9	23.9	28.0	28.5	0.0	23.3
137	26.2	26.4	26.2	24.6	25.9	24.2	28.2	28.4	0.0	23.3

Missing data (blanks) are due to equipment malfuntion.

Table AII-2 (cont.)

Cold Condition
Mean SkinTemperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
138	26.3	26.4	26.5	24.5	25.8	24.4	28.2	28.2	0.0	23.4
139	25.8	26.4	26.5	24.4	25.4	24.8	28.3	27.7	0.0	23.3
140	25.7	26.5	26.5	24.4	26.0	25.0	28.4	27.4	28.2	26.5
141	25.7	26.4	27.2	24.5	26.4	25.1	28.4	27.3	0.0	23.4
142	25.7	26.4	26.8	24.7	26.4	25.0	28.5	27.4	0.0	23.4
143	26.3	26.4	26.2	24.4	26.5	25.1	28.6	27.6	0.0	23.5
144	26.3	26.4	26.4	24.0	26.6	25.0	28.8	27.6	0.0	23.5
145	26.3	26.4	26.4	23.8	26.7	25.0	28.9	27.6	29.0	26.7
146	25.9	26.5	26.0	24.2	26.6	25.0	28.9	27.4	0.0	23.4
147	26.0	26.5	25.9	24.3	26.6	24.9	28.8	27.4	0.0	23.4
148	26.3	26.5	26.2	24.4	26.7	25.0	28.8	27.3	0.0	23.5
149	25.7	26.5	26.4	24.3	26.8	24.9	28.8	27.2	0.0	23.4
150	25.7	26.5	26.8	24.2	26.8	24.9	28.8	27.1	28.6	26.6
151	26.2	26.4	26.6	24.2	26.7	25.0	28.8	27.4	0.0	23.5
152	25.9	26.3	26.9	24.3	26.7	24.9	28.8	27.6	0.0	23.5
153	26.4	26.3	27.1	24.3	26.6	24.9	28.9	27.9	0.0	23.6
154	25.9	26.2	26.6	24.4	26.6	25.0	28.9	27.8	0.0	23.5
155	26.6	26.2	26.5	24.1	26.5	25.1	28.7	27.9	28.3	26.7
156	27.0	26.3	26.5	24.4	26.4	25.1	28.2	27.9	0.0	23.5
157	27.2	26.3	26.5	24.3	25.9	25.0	28.3	28.0	0.0	23.5
158	27.2	26.2	26.3	23.8	26.3	24.9	28.2	28.1	0.0	23.4
159	26.9	26.2	26.6	23.9	26.3	24.7	28.1	28.1	0.0	23.4
160	27.2	26.2	26.6	23.9	26.4	24.5	28.2	28.0	28.1	26.6
161	26.7	26.3	26.7	23.6	26.5	24.2	28.1	28.1	0.0	23.4
162	26.5	26.3	26.6	23.9	26.2	24.0	27.7	27.9	0.0	23.2
163	26.9	26.3	26.4	23.9	25.7	24.3	28.0	27.9	0.0	23.3
164	26.8	26.4	26.7	23.7	25.7	24.5	27.6	28.0	0.0	23.3
165	26.7	26.5	27.1	23.7	25.2	24.3	27.8	28.2	27.9	26.4
166	26.1	26.5	27.2	23.8	25.6	23.9	28.1	28.0	0.0	23.2
167	26.0	26.5	27.2	23.5	26.2	24.2	28.3	27.8	0.0	23.3
168	25.8	26.6	26.8	23.3	26.3	24.1	28.6	27.8	0.0	23.3
169	25.8	26.6	26.2	23.2	26.3	23.7	28.7	27.8	0.0	23.1
170	26.0	26.6	26.2	23.6	26.5	23.8	28.8	27.5	27.7	26.3
171	25.7	26.6	26.1	23.9	26.4	24.4	28.9	27.3	0.0	23.3
172	25.6	26.6	26.9	23.9	26.3	24.6	28.8	27.2	0.0	23.3
173	25.6	26.5	27.0	24.2	26.2	24.6	28.8	27.3	0.0	23.4
174	25.8	26.5	26.6	24.4	25.6	24.7	28.8	27.3	0.0	23.3
175	25.9	26.5	26.4	24.6	25.7	24.7	28.8	27.3	28.6	26.5
176	26.1	26.5	26.1	24.5	25.7	24.7	28.7	27.7	0.0	23.3
177	26.1	26.5	26.2	24.6	25.7	24.7	28.5	28.0	0.0	23.4
178	26.3	26.4	26.5	24.5	25.2	24.7	28.5	28.2	0.0	23.4
179	26.8	26.4	26.3	24.3	24.2	24.7	28.6	28.2	0.0	23.3
180	33.1	0.0	0.0	24.4	0.0	24.6	28.5	27.7	28.5	18.5

Missing data (blanks) are due to equipment malfuntion.

Table AII-2 (cont.)

SST Condition
Mean SkinTemperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
0	33.3	33.4	31.8	34.4	33.3	33.1		33.9		33.3
1	33.1		32.9			33.4				33.1
2	32.5		32.9			33.3				32.9
3	32.0		32.1			32.5				32.2
4	31.7		31.6			31.8				31.7
5	31.4	31.8	31.4	32.3	31.6	31.4		32.8		31.8
6	31.1		30.8			31.0				31.0
7	30.7		30.5			30.6				30.6
8	30.5		30.2			30.2				30.3
9	30.3					30.2				30.3
10	30.1	30.2		31.5	30.3	29.9		30.6		30.4
11	29.9					30.0				30.0
12	29.8					29.8				29.8
13	29.5					29.5				29.5
14	29.6					29.8				29.7
15	29.4	29.2		30.7	29.9	29.6		30.4		29.9
16	29.2					29.3				29.3
17	28.9					29.0				29.0
18	28.7					29.0				28.9
19	28.7					28.8				28.8
20	28.7	28.8	27.1	30.2	29.2	28.3		30.3		28.9
21	28.5		27.6			28.1				28.1
22	28.4		27.6			28.3				28.1
23	28.4		28.1			27.9				28.1
24	28.3		27.9			27.7				28.0
25	28.2	28.6	27.9	29.9	28.5	28.0		30.2		28.7
26	28.2		27.9			28.0				28.0
27	28.0		27.8			28.1				28.0
28	27.9		27.3			28.1				27.8
29	27.9		27.1			28.3				27.8
30	27.9	28.3	26.8	29.5	28.5	28.1		30.0		28.4
31	27.7		26.9			28.0				27.5
32	27.6		26.7			28.0				27.4
33	27.4		26.7			28.1				27.4
34	27.3		26.8			28.1				27.4
35	27.3	28.3	26.7	29.1	28.1	28.1		29.5		28.2
36	27.2		26.9			28.2				27.4
37	27.1		26.6			28.2				27.3
38	27.1		26.4			28.2				27.2
39	27.1		26.0			27.8				27.0
40	27.1	28.1	26.0	29.2	28.2	27.8		29.2		28.0
41	27.1		26.4			27.7				27.1
42	27.1		26.5			27.8				27.1
43	27.0		26.2			27.4				26.9
44	27.0		25.9			27.6				26.8

Missing data (blanks) are due to equipment malfuntion.

Table AII-2 (cont.)

SST Condition
Mean SkinTemperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
45	27.0	27.8	26.1	28.7	28.4	27.4		29.4		27.8
46	26.9		26.5			27.4				26.9
47	26.8		26.9			27.5				27.1
48	26.8		27.2			27.7				27.2
49	26.7		27.2			27.7				27.2
50	26.6	27.7	27.2	28.5	27.9	27.6		29.4		27.8
51	26.6		27.1			27.6				27.1
52	26.5		26.9			27.4				26.9
53	26.4		26.8			27.3				26.8
54	26.3		26.8			27.2				26.8
55	26.3	27.4	26.9	28.6	27.4	26.9		29.5		27.6
56	26.4		26.8			26.8				26.7
57	26.4		26.6			26.7				26.6
58	26.4		26.5			27.2				26.7
59	26.5		26.0			27.0				26.5
60	26.4	27.6	26.6	28.4	27.7	26.4		29.4		27.5
61	26.3		26.7			26.2				26.4
62	26.3		26.9			25.9				26.4
63	26.3		27.0			26.1				26.5
64	26.3		27.2			26.3				26.6
65	26.2	27.6	26.9	28.1	27.3	26.1		29.1		27.3
66	26.1		26.4			25.9				26.1
67	26.1		26.4			25.8				26.1
68	26.1		26.2			25.6				26.0
69	26.1		25.6			25.5				25.7
70	26.1	27.5	25.4	28.4	27.1	25.5		29.0		27.0
71	26.1		25.5			25.8				25.8
72	26.1		25.4			25.9				25.8
73	26.2		25.5			25.9				25.9
74	26.3		25.8			26.1				26.1
75	26.1	27.7	26.4	27.8	27.1	26.3		29.0		27.2
76	26.2		26.7			26.7				26.5
77	26.1		26.6			26.2				26.3
78	26.0		26.4			26.0				26.1
79	25.9		26.6			26.3				26.3
80	26.0	27.3	26.4	27.8	27.0	26.3		29.1		27.1
81	26.0		26.1			26.3				26.1
82	26.0		26.2			25.9				26.0
83	26.0		26.4			25.8				26.1
84	26.1		26.4			25.7				26.1
85	26.1	27.0	26.4	28.1	27.1	25.8		29.0		27.1
86	26.0		26.2			25.8				26.0
87	26.2		26.2			25.8				26.1
88	26.2		26.2			25.7				26.0
89	26.2		26.2			25.8				26.1

Missing data (blanks) are due to equipment malfuntion.

Table AII-2 (cont.)

SST Condition
Mean SkinTemperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
90	26.2	26.8	26.0	28.2	26.6	25.6		29.2		27.0
91	26.1		25.6			25.5				25.7
92	26.2		25.7			25.4				25.8
93	26.1		25.4			25.5				25.7
94	26.0		25.6			25.5				25.7
95	26.0	27.2	25.7	28.2	26.5	25.5		28.9		26.9
96	26.1		25.7			25.3				25.7
97	26.1		26.2			25.3				25.9
98	26.2		26.6			25.6				26.1
99	26.1		26.8			25.5				26.1
100	26.0	27.8	26.2	27.8	26.6	25.3		29.0		27.0
101	26.1		24.9			25.4				25.5
102	26.0		25.7			25.5				25.7
103	25.9		25.6			26.0				25.8
104	25.8		26.0			26.5				26.1
105	25.8	27.5	25.7	27.8	26.4	26.2		29.1		26.9
106	25.7		25.5			25.6				25.6
107	25.7		25.3			25.4				25.5
108			25.2			25.4				25.3
109			25.4			25.6				25.5
110		27.5	26.1	27.8	26.7	25.8		29.3		27.2
111			26.4			25.8				26.1
112			26.1			25.9				26.0
113	25.6		26.0			26.0				25.9
114	25.7		26.0			25.9				25.9
115	25.6	27.1	25.8	27.8	26.6	25.7		29.0		26.8
116	25.6		25.9			25.5				25.7
117	25.6		26.0			25.4				25.7
118	25.6		25.4			25.7				25.6
119	25.6		25.9			25.9				25.8
120	25.7	27.2	26.0	27.6	26.5	25.8		28.8		26.8
121	25.7		26.1			25.5				25.8
122	25.7		25.8			25.7				25.7
123	25.9		25.5			25.7				25.7
124	25.9		25.8			25.6				25.8
125	25.8	27.2	25.9	27.9	26.5	25.1		28.7		26.7
126	25.9		25.5			24.9				25.4
127	25.8		25.8			24.9				25.5
128	25.8		25.9			25.1				25.6
129	25.8		25.6			25.2				25.5
130	25.8	27.3	25.3	27.5	26.4	25.3		28.9		26.6
131	25.8		25.1			25.5				25.5
132	25.8		25.5			25.4				25.6
133	25.7		25.8			26.5				26.0
134	25.7		25.4			25.9				25.7

Missing data (blanks) are due to equipment malfuntion.

Table AII-2 (cont.)

SST Condition
Mean SkinTemperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
135	25.6	27.2	25.6	27.3	26.5	26.2		28.8		26.8
136	25.7		26.0			26.0				25.9
137	25.7		26.1			25.8				25.9
138	25.8		25.7			26.0				25.8
139	25.8		26.1			26.0				26.0
140	25.9	27.2	26.1	27.6	26.4	25.8		28.9		26.8
141	26.0		25.8			25.4				25.7
142	26.1		25.4			25.1				25.5
143	26.1		25.3			25.1				25.5
144	26.1		25.3			25.4				25.6
145	26.0	27.0	25.4	27.7	26.4	25.6		29.0		26.7
146	25.8		25.8			25.4				25.7
147	25.7		26.0			25.2				25.6
148	25.7		25.9			25.4				25.7
149	25.7		25.8			25.5				25.7
150	25.8	27.0	25.3	27.7	26.2	25.4		29.0		26.6
151	25.8		24.6			25.6				25.3
152	25.8		24.6			25.8				25.4
153	25.9		25.0			25.4				25.4
154	26.0		25.3			25.1				25.5
155	25.9	27.1	25.4	27.7	26.1	25.0		29.2		26.6
156	25.9		25.4			25.0				25.4
157	25.9		25.3			25.2				25.5
158	25.9		24.7			25.5				25.4
159	25.8		24.9			25.6				25.4
160	25.9	27.0	24.6	27.7	26.0	25.7		28.7		26.5
161	25.9		24.4			25.4				25.2
162	25.8		25.0			25.6				25.5
163	25.7		24.9			25.7				25.4
164	25.7		25.0			25.5				25.4
165	25.6	26.7	25.5	27.6	26.2	25.4		28.8		26.5
166	25.7		25.8			25.5				25.7
167	25.8		25.6			25.5				25.6
168	26.0		25.5			25.5				25.7
169	26.1		25.6			25.4				25.7
170	26.1	26.8	25.7	27.7	25.7	25.2		28.8		26.6
171	26.1		26.0			24.9				25.7
172	26.1		26.0			24.9				25.7
173	26.0		25.6			24.9				25.5
174	26.1		25.3			25.4				25.6
175	26.0	26.8	25.2	27.7	25.9	25.3		20.5		25.3
176	33.4		25.1			24.8				27.8
177			25.3			25.0				25.2
178			25.6			25.2				25.4
179						25.2				25.2

Missing data (blanks) are due to equipment malfuntion.

Table AII-3

Warm Condition
FingerTemperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
0	23.3	35.3	31.8	33.6	29.8		32.5	29.9	32.9	31.1
1	22.8	34.5	31.6	32.9	29.6		31.5	29.6	33.0	30.7
2	22.5	34.3	31.8	32.4	28.7		31.9	28.7	33.6	30.5
3	22.4	34.6	33.1	32.5	28.8		32.3	28.4	34.3	30.8
4	22.0	34.5	34.1	33.2	28.8		33.6	28.2	34.9	31.2
5	22.5	35.0	33.9	33.3	29.1		33.1	29.9	33.8	31.3
6	23.3	35.2	32.8	32.1	29.1		32.3	30.8	34.2	31.2
7	23.9	35.6	32.5	31.2	28.7		32.1	30.2	33.1	30.9
8	24.2	35.0	31.7	30.2	28.1		30.5	31.4	32.0	30.4
9	23.7	35.1	31.7	30.0	27.6		30.4	32.9	32.2	30.5
10	23.0	34.4	30.7	29.7	27.1		29.7	32.1	31.4	29.8
11	22.8	33.1	29.9	29.4	27.1		28.6	30.8	31.0	29.1
12	22.2	32.0	29.4	28.7	26.2		27.7	30.2	31.1	28.4
13	21.8	32.1	29.9	28.5	25.9		27.5	30.5	30.7	28.4
14	21.8	32.8	31.2	28.0	25.8		27.0	30.7	32.7	28.8
15	22.2	32.5	30.8	27.4	26.2		27.6	31.1	33.0	28.9
16	22.3	32.2	30.9	27.0	26.8		26.9	31.7	31.7	28.7
17	22.0	31.2	32.9	26.7	27.1		27.1	31.6	31.2	28.7
18	21.6	30.6	33.5	26.4	26.7		26.7	30.5	31.1	28.4
19	21.6	29.8	33.5	25.9	26.2		26.7	31.9	30.9	28.3
20	21.0	29.1	32.5	25.5	26.7		27.5	31.7	32.3	28.3
21	20.9	28.8	32.0	25.1	30.3		28.7	31.3	33.7	28.9
22	21.4	28.7	32.5	25.1	32.1		30.5	32.3	34.6	29.7
23	21.5	29.4	32.8	24.9	32.5		31.3	33.6	35.3	30.2
24	21.7	32.5	33.2	25.2	33.8		30.4	34.0	35.3	30.8
25	22.2	32.6	33.4	26.8	34.0		30.8	34.3	34.9	31.1
26	22.1	32.6	32.6	30.1	34.0		32.2	34.7	34.5	31.6
27	22.0	32.8	31.9	31.9	34.0		33.3	34.4	34.2	31.8
28	21.8	31.9	31.2	32.6	33.6		33.2	34.5	33.8	31.6
29	21.6	30.7	32.7	32.1	33.2		33.7	34.2	33.5	31.5
30	21.5	29.8	34.1	31.4	33.1		34.0	33.1	34.3	31.4
31	21.6	29.8	34.2	30.6	32.9		33.4	33.3	35.0	31.4
32	22.0	30.7	33.5	29.5	33.4		33.3	33.8	34.5	31.3
33	22.4	30.1	34.3	29.6	33.7		32.8	33.7	34.2	31.4
34	22.4	29.3	34.3	31.2	34.3		31.9	34.1	34.0	31.4
35	22.0	28.8	33.4	32.6	34.4		31.3	33.8	34.5	31.4
36	21.6	28.4	32.5	32.5	33.5		31.2	32.5	34.5	30.8
37	21.2	28.0	31.6	32.3	32.1		30.3	31.8	33.9	30.2
38	21.0	28.0	31.6	32.6	31.2		30.1	32.1	34.3	30.1
39	20.7	27.6	31.0	33.4	30.1		29.0	31.5	32.9	29.5
40	20.7	27.2	30.7	28.9	29.1		28.2	31.7	32.7	28.7
41	20.8	27.4	30.2	28.5	29.1		27.7	32.6	32.0	28.5
42	21.1	27.2	29.4	27.5	29.2		26.6	32.3	31.3	28.1
43	20.9	26.9	28.7	27.0	28.7		26.0	32.6	31.3	27.8
44	20.9	26.7	28.0	26.3	28.2		25.9	32.6	31.2	27.5
45	20.8	26.3	27.5	25.8	28.0		25.9	31.8	31.1	27.2

Missing data (blanks) are due to equipment malfuntion.

Table AII-3 (cont.)

Warm Condition
Finger Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
46	20.8	26.1	27.4	25.6	29.9		25.7	31.7	31.0	27.3
47	20.8	25.4	26.9	25.5	30.5		25.9	31.7	31.5	27.3
48	20.9	24.9	26.6	25.3	31.3		25.7	31.7	33.9	27.5
49	21.2	24.9	26.6	25.1	32.7		25.3	31.3	34.4	27.7
50	21.2	25.1	26.5	24.6	33.3		25.0	31.4	35.0	27.8
51	21.2	25.7	26.4	24.6	33.8		25.3	33.1	35.4	28.2
52	21.1	25.9	26.1	24.4	33.9		25.4	32.9	35.4	28.1
53	21.3	25.7	26.2	24.8	33.7		25.7	32.7	35.1	28.2
54	21.1	25.7	26.5	25.0	33.8		25.7	32.5	35.2	28.2
55	21.2	25.3	26.4	25.0	33.9		25.8	31.9	35.4	28.1
56	21.3	24.9	26.2	24.9	33.5		25.7	30.9	34.9	27.8
57	21.4	24.6	26.2	24.8	33.8		25.7	30.1	34.9	27.7
58	21.8	24.9	26.2	24.5	34.0		25.7	29.5	34.9	27.7
59	22.1	24.7	25.9	24.2	33.7		25.5	29.8	33.7	27.5
60	22.0	24.5	25.5	23.8	33.7		25.3	30.9	36.5	27.8
61	21.7	24.1	25.1	23.5	33.8		25.2	31.4	33.0	27.2
62	21.3	23.8	24.7	23.3	33.7		25.4	30.2	33.1	26.9
63	21.1	23.6	24.4	23.5	32.9		25.6	29.3	33.2	26.7
64	21.4	23.6	24.3	23.2	32.5		26.1	28.9	34.1	26.8
65	21.6	23.4	24.3	23.2	32.3		27.2	28.5	34.2	26.8
66	21.8	23.2	24.2	23.1	31.6		27.3	28.8	33.2	26.7
67	21.9	23.0	24.1	23.1	30.8		27.2	29.3	33.0	26.6
68	22.3	23.0	24.1	22.9	30.6		26.8	28.8	32.1	26.3
69	21.8	23.1	24.2	22.8	30.4		26.1	29.9	32.3	26.3
70	21.4	23.0	24.6	22.3	29.9		25.2	29.6	31.4	25.9
71	21.1	22.7	23.8	22.3	29.3		25.3	29.9	31.4	25.7
72	20.9	22.5	23.3	22.5	28.6		25.2	31.2	30.7	25.6
73	20.6	22.3	23.1	22.6	28.1		25.1	30.9	30.1	25.4
74	20.9	22.2	23.0	22.4	27.6		24.9	30.4	29.7	25.1
75	21.0	22.2	23.2	22.3	27.1		24.7	30.3	29.8	25.1
76	21.3	22.3	23.1	22.3	26.7		24.5	30.1	29.8	25.0
77	21.0	22.4	23.0	22.2	26.4		24.4	31.2	30.6	25.2
78	20.7	22.4	22.9	22.1	26.3		24.4	32.0	30.4	25.2
79	20.8	22.5	22.9	22.1	26.0		24.5	31.2	30.8	25.1
80	20.3	22.5	22.9	22.2	25.7		24.6	30.9	31.7	25.1
81	20.3	22.3	22.9	22.4	25.7		24.5	30.4	31.4	25.0
82	20.3	22.3	22.9	22.9	25.3		24.6	29.9	32.2	25.1
83	20.8	22.1	22.9	23.0	25.2		24.9	29.8	32.6	25.2
84	21.1	22.3	23.0	22.7	24.8		24.7	31.4	32.9	25.4
85	21.3	22.5	23.0	22.4	25.0		24.8	32.7	32.6	25.5
86	21.3	22.8	22.9	22.2	25.3		25.4	32.7	32.5	25.6
87	21.0	22.6	22.8	21.9	25.8		26.2	33.0	32.1	25.7
88	21.2	22.6	22.7	22.0	26.9		29.5	33.0	31.2	26.1
89	21.2	22.4	22.5	22.1	27.3		30.6	32.5	31.1	26.2
90	21.0	22.3	22.6	22.0	27.0		30.4	33.0	32.3	26.3
91	21.2	22.1	22.6	21.9	26.2		30.0	31.3	32.5	26.0

Missing data (blanks) are due to equipment malfuntion.

Table AII-3 (cont.)

Warm Condition
Finger Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
92	21.3	21.8	22.9	21.7	25.7		29.2	31.1	32.9	25.8
93	21.4	21.9	23.3	21.8	25.9		28.1	31.2	32.5	25.8
94	21.5	22.0	23.6	21.6	26.0		27.4	31.6	32.2	25.7
95	21.5	22.3	23.9	21.4	26.5		27.4	31.5	32.1	25.8
96	21.6	22.4	23.7	21.5	26.3		27.0	31.0	31.5	25.6
97	21.5	22.3	23.2	21.8	26.0		27.3	30.4	30.7	25.4
98	21.1	22.2	22.8	21.8	25.6		27.3	31.0	30.0	25.2
99	20.8	21.8	22.8	21.8	25.1		27.0	31.3	29.1	25.0
100	20.9	21.6	22.9	21.7	24.5		24.9	30.6	28.8	24.5
101	21.0	21.8	23.0	21.6	24.0		24.7	29.4	28.6	24.3
102	20.9	22.0	22.8	21.4	23.7		24.6	28.9	28.8	24.1
103	20.8	22.4	22.6	21.2	23.5		24.5	29.7	29.1	24.2
104	20.7	22.5	23.7	21.2	23.9		24.3	29.2	29.0	24.3
105	20.6	22.4	22.7	21.4	24.1		24.1	29.7	30.4	24.4
106	20.4	22.4	22.7	21.5	24.1		24.0	29.3	31.9	24.5
107	20.6	22.6	22.9	21.6	24.2		23.8	28.9	31.7	24.5
108	20.7	22.3	23.0	21.6	24.2		24.0	28.4	31.6	24.5
109	21.1	22.1	23.0	21.5	24.2		24.1	28.3	32.2	24.6
110	21.6	22.2	23.0	21.5	24.3		23.9	28.8	32.9	24.8
111	21.6	22.5	23.2	21.3	24.2		24.0	28.7	33.7	24.9
112	21.7	22.6	23.4	21.1	24.3		23.9	29.8	33.2	25.0
113	21.7	22.7	23.2	21.2	24.3		23.9	29.4	32.5	24.9
114	21.4	22.6	23.2	21.3	24.4		23.7	29.5	31.9	24.8
115	21.1	22.4	22.8	21.4	24.5		23.5	29.0	31.6	24.5
116	20.9	22.3	22.3	21.4	24.5		23.7	28.8	31.5	24.4
117	21.1	22.0	22.4	21.4	24.6		23.7	28.2	31.0	24.3
118	21.2	21.7	22.6	21.3	24.2		23.7	27.7	32.1	24.3
119	21.3	21.8	22.9	21.1	24.0		24.4	27.9	33.5	24.6
120	21.5	21.9	22.8	21.0	23.9		24.7	28.5	34.5	24.9
121	21.2	22.0	22.7	20.9	24.0		24.3	28.3	34.1	24.7
122	21.2	22.1	22.6	21.0	24.0		24.0	28.0	33.1	24.5
123	21.2	22.1	22.7	21.0	24.2		23.6	27.5	32.4	24.3
124	21.4	22.0	22.5	21.4	24.2		23.3	26.8	31.2	24.1
125	21.4	22.1	22.1	21.2	24.1		23.3	26.3	30.8	23.9
126	21.4	21.7	22.0	21.5	23.9		23.6	26.0	30.0	23.8
127	21.3	21.4	22.1	21.6	23.7		23.7	26.5	29.9	23.8
128	21.5	21.4	22.2	21.6	23.4		23.4	26.4	29.7	23.7
129	21.2	21.6	22.4	21.3	23.3		23.9	26.1	29.4	23.7
130	21.1	21.8	22.5	21.3	23.4		22.9	26.9	29.1	23.6
131	21.0	21.9	22.6	21.3	23.4		23.0	26.3	28.3	23.5
132	21.1	22.0	22.4	21.3	23.3		23.0	26.3	28.1	23.4
133	20.6	23.1	22.5	21.4	23.5		23.2	26.2	27.7	23.5
134	20.5	23.2	22.2	21.3	23.2		23.0	26.1	27.6	23.4
135	20.7	22.3	22.1	21.2	22.9		22.8	26.8	29.0	23.5
136	21.0	22.2	22.4	21.1	22.8		22.9	25.8	30.6	23.6
137	21.4	22.1	22.6	21.0	22.8		22.9	26.7	31.5	23.9

Missing data (blanks) are due to equipment malfuntion.

Table AII-3 (cont.)

Warm Condition
Finger Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
138	21.6	22.2	22.9	20.9	23.2		23.0	26.1	30.3	23.8
139	21.2	22.4	24.3	21.0	23.1		23.1	26.2	29.8	23.9
140	21.5	22.4	25.4	21.1	23.0		23.4	26.2	28.9	24.0
141	21.3	22.5	25.8	21.3	23.1		23.1	25.8	28.4	23.9
142	20.6	22.4	25.8	21.3	22.8		23.4	25.6	27.9	23.7
143	20.4	22.3	25.9	21.2	22.6		23.6	25.4	27.8	23.7
144	20.6	22.0	26.1	21.1	22.5		23.3	25.4	27.7	23.6
145	21.1	21.9	26.3	21.0	22.5		23.2	25.4	27.5	23.6
146	21.1	21.9	27.4	20.7	22.2		23.1	25.4	27.0	23.6
147	21.2	22.1	28.1	20.8	22.2		23.2	26.4	26.4	23.8
148	21.0	22.2	28.8	20.8	22.4		23.2	26.5	25.8	23.8
149	20.8	22.4	29.0	21.0	22.5		23.1	26.4	25.5	23.8
150	20.5	22.4	29.0	21.3	22.3		22.9	27.1	25.7	23.9
151	20.3	22.1	28.8	21.1	22.1		22.7	26.8	25.6	23.7
152	20.2	21.8	27.7	21.3	22.0		22.6	26.4	26.5	23.6
153	20.3	21.5	27.0	20.9	21.9		22.6	27.0	25.9	23.4
154	20.8	21.4	26.5	20.9	21.4		22.4	27.3	26.4	23.4
155	20.9	21.5	26.3	21.1	21.4		22.4	27.1	25.9	23.3
156	21.1	21.7	26.7	21.0	21.5		22.4	26.7	25.4	23.3
157	20.9	21.7	26.6	21.0	21.5		22.7	26.2	25.2	23.2
158	21.1	21.7	25.7	21.1	21.7		23.5	26.1	25.2	23.3
159	20.3	21.6	25.3	21.1	21.8		23.2	25.9	25.3	23.1
160	20.3	21.6	24.9	21.1	21.8		23.1	27.1	25.6	23.2
161	20.3	21.5	24.8	21.0	21.6		22.1	29.5	26.4	23.4
162	20.6	21.3	24.6	20.9	21.5		22.1	29.1	26.4	23.3
163	20.9	21.3	24.4	20.7	21.3		22.3	28.4	26.7	23.3
164	20.7	21.8	24.2	20.8	21.2		22.4	28.1	26.1	23.2
165	20.6	21.9	24.1	20.7	21.3		22.5	27.7	25.6	23.1
166	20.7	22.2	23.8	20.7	21.6		22.7	27.7	26.1	23.2
167	20.7	22.1	23.8	20.7	21.6		22.6	27.9	26.0	23.2
168	20.4	22.0	23.8	20.8	21.8		22.5	27.9	25.7	23.1
169	20.4	21.7	23.7	20.6	21.8		22.4	28.2	25.3	23.0
170	20.7	21.5	23.9	20.6	22.0		22.4	28.2	25.6	23.1
171	21.3	21.8	23.7	21.1	22.2		22.4	29.7	25.4	23.5
172	21.5	21.8	23.8	20.8	22.0		22.4	30.8	24.9	23.5
173	21.2	21.6	24.1	21.0	22.0		22.4	31.0	24.9	23.5
174	21.2	21.8	24.1	21.0	22.2		22.4	30.7	24.4	23.5
175	20.7	22.1	23.8		22.3		22.6	30.2	24.1	23.7
176	20.5	22.1	23.4		22.3		22.4	29.7		23.4
177	20.6	21.9	23.1		22.3		22.2	29.4		23.3
178	20.4	21.2	22.8		22.1		21.9	29.3		23.0
179	35.3	21.5	22.4		21.9		21.8	29.4		25.4

Missing data (blanks) are due to equipment malfuntion.

Table AII-3 (cont.)

Cold Condition
Finger Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
0	28.4	30.5	32.7	35.7	33.2	23.3	29.9	35.1	22.3	30.1
1	25.1	29.4	29.6	34.1	32.3	23.3	28.9	33.0	0.0	26.2
2	22.5	27.6	30.8	32.2	28.9	22.5	27.0	30.1	0.0	24.6
3	20.9	27.8	30.9	31.9	25.8	22.1	25.3	30.5	0.0	23.9
4	20.8	27.7	30.2	31.9	25.3	22.7	23.4	30.4	0.0	23.6
5	19.7	27.4	25.5	30.7	23.9	22.5	21.6	29.3	21.0	24.6
6	19.5	26.9	23.3	29.0	22.7	21.8	20.4	28.1	0.0	21.3
7	18.2	25.7	22.3	27.3	19.6	20.6	18.7	26.4	0.0	19.9
8	17.2	21.9	21.5	26.1	17.7	19.9	18.8	27.0	0.0	18.9
9	15.6	19.5	20.3	24.6	16.7	18.1	18.7	26.9	0.0	17.8
10	15.1	17.9	18.6	22.8	15.5	17.0	17.3	24.3	14.6	18.1
11	17.0	16.1	17.8	21.5	15.8	15.7	16.2	23.3	0.0	15.9
12	17.4	14.3	17.2	20.5	16.7	14.7	14.9	21.1	0.0	15.2
13	16.9	13.2	16.6	18.0	17.0	13.8	14.2	19.5	0.0	14.4
14	17.1	13.2	16.6	16.9	15.4	13.6	13.9	17.5	0.0	13.8
15	15.7	12.9	16.8	15.4	14.2	14.1	13.8	16.3	11.0	14.5
16	15.1	13.2	16.2	16.6	12.8	14.6	12.9	16.4	0.0	13.1
17	15.3	13.8	16.3	16.7	13.7	14.0	12.5	16.5	0.0	13.2
18	14.7	13.2	16.3	17.1	14.7	13.7	12.4	16.5	0.0	13.2
19	15.1	14.1	17.6	16.8	14.4	14.4	12.3	15.8	0.0	13.4
20	15.2	13.8	18.3	16.6	12.7	14.7	12.2	15.9	13.9	14.8
21	15.2	14.1	18.4	15.9	11.8	14.9	11.8	16.1	0.0	13.1
22	15.6	14.6	18.5	15.3	10.9	15.3	11.9	16.4	0.0	13.2
23	16.4	15.0	18.7	15.2	10.2	15.4	11.5	16.8	0.0	13.2
24	16.4	15.4	19.0	15.8	10.0	15.5	11.1	17.2	0.0	13.4
25	16.5	15.8	19.0	16.7	10.3	15.8	11.2	17.6	13.8	15.2
26	16.8	16.0	18.9	17.6	13.0	16.1	11.4	17.8	0.0	14.2
27	16.4	16.4	19.1	17.8	14.9	16.4	11.8	18.0	0.0	14.5
28	15.8	16.7	19.1	19.6	15.4	16.8	12.0	18.2	0.0	14.8
29	16.7	16.9	19.3	20.3	15.4	17.1	12.1	18.4	0.0	15.1
30	17.1	17.1	18.8	20.6	14.9	17.3	12.2	18.7	12.4	16.6
31	16.8	16.6	15.5	19.4	14.6	17.0	11.6	17.0	0.0	14.3
32	13.9	15.4	14.9	18.0	13.6	16.2	10.6	16.9	0.0	13.3
33	14.6	15.9	16.3	18.0	0.0	16.6	10.1	17.3	0.0	12.1
34	15.2	16.2	15.1	17.8	0.0	17.0	10.4	17.6	0.0	12.1
35	15.8	16.3	15.7	17.4	0.0	17.0	10.6	16.8	15.2	13.9
36	14.0	16.4	14.6	16.4	0.0	15.9	12.1	16.9	0.0	11.8
37	14.6	15.4	14.1	15.7	0.0	15.5	11.3	16.1	0.0	11.4
38	15.4	13.7	13.7	14.7	0.0	14.5	11.6	15.1	0.0	11.0
39	14.1	12.6	13.4	16.8	0.0	13.0	11.2	14.4	0.0	10.6
40	13.2	11.2	12.5	17.4	0.0	11.7	11.6	14.7	9.5	11.3
41	11.6	10.0	11.6	17.2	0.0	11.6	12.0	15.1	0.0	9.9
42	12.3	9.9	11.0	17.1	0.0	11.7	11.8	15.4	0.0	9.9
43	12.6	10.8	11.5	15.0	0.0	11.5	11.9	14.7	0.0	9.8
44	12.1	10.6	12.5	14.2	0.0	11.5	10.6	13.3	0.0	9.4
45	11.9	11.1	13.2	13.3	0.0	11.0	10.1	13.1	10.0	10.4

Missing data (blanks) are due to equipment malfuntion.

Table AII-3 (cont.)

Cold Condition
Finger Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
46	11.9	11.7	12.9	12.1	0.0	10.6	11.4	12.1	0.0	9.2
47	12.8	11.4	12.4	11.1	0.0	11.3	11.6	10.4	0.0	9.0
48	14.1	11.1	12.6	9.4	0.0	11.8	12.6	12.1	0.0	9.3
49	13.2	11.2	13.7	11.2	0.0	12.3	11.5	12.0	0.0	9.5
50	15.8	11.1	14.4	11.7	0.0	12.8	10.7	11.9	15.0	11.5
51	15.4	11.0	15.0	12.5	0.0	13.2	11.1	11.2	0.0	9.9
52	15.7	11.0	14.1	12.2	0.0	13.5	12.7	11.1	0.0	10.0
53	15.9	11.2	16.1	12.1	0.0	13.7	12.1	11.6	0.0	10.3
54	16.4	12.5	17.7	11.8	0.0	14.0	11.7	13.2	0.0	10.8
55	16.8	13.0	18.2	12.6	0.0	14.4	12.2	14.7	15.6	13.1
56	17.1	13.5	18.6	14.2	0.0	14.7	12.3	15.8	0.0	11.8
57	16.4	14.2	19.1	14.6	0.0	14.9	12.4	16.6	0.0	12.0
58	16.7	14.7	19.5	15.8	0.0	15.0	12.5	17.0	0.0	12.4
59	17.0	15.1	19.7	16.6	0.0	15.3	12.6	17.4	0.0	12.6
60	15.5	15.5	19.8	18.3	0.0	15.6	12.6	17.7	16.9	14.7
61	13.9	15.6	19.1	18.8	0.0	16.0	11.3	17.4	0.0	12.5
62	15.1	14.2	16.1	15.8	0.0	15.5	10.7	17.4	0.0	11.6
63	14.7	14.7	15.5	14.1	0.0	14.8	9.5	17.4	0.0	11.2
64	15.3	15.7	17.2	11.0	0.0	15.3	9.5	15.7	0.0	11.1
65	13.8	16.2	17.1	10.0	0.0	15.5	10.2	16.0	18.7	13.1
66	14.3	15.8	16.6	13.3	0.0	15.8	10.1	16.3	0.0	11.4
67	14.4	13.7	15.3	14.6	0.0	16.0	10.1	16.4	0.0	11.2
68	13.5	11.8	14.7	13.9	0.0	15.8	11.4	16.7	0.0	10.9
69	12.6	10.9	14.0	14.2	0.0	15.4	11.0	16.0	0.0	10.5
70	11.3	9.7	12.4	12.4	0.0	14.5	10.3	16.1	11.2	10.9
71	11.6	9.1	11.7	11.5	0.0	12.9	10.5	16.5	0.0	9.3
72	12.7	10.2	11.7	9.7	0.0	11.7	10.7	16.6	0.0	9.3
73	12.4	10.5	12.5	9.2	0.0	11.2	10.5	15.5	0.0	9.1
74	12.1	10.2	12.6	12.6	0.0	11.5	9.6	16.0	0.0	9.4
75	12.2	10.3	12.2	12.9	0.0	11.4	9.0	14.9	9.6	10.3
76	13.5	10.5	11.8	13.3	0.0	10.9	8.1	13.8	0.0	9.1
77	15.8	10.7	12.4	12.5	0.0	11.0	9.6	12.9	0.0	9.4
78	16.1	11.1	14.0	11.8	0.0	11.5	9.8	12.6	0.0	9.7
79	14.6	11.6	13.6	12.5	0.0	11.9	10.0	13.0	0.0	9.7
80	14.1	12.1	15.0	14.8	0.0	12.4	10.2	11.7	10.7	11.2
81	14.0	12.5	16.1	14.1	0.0	12.8	9.9	11.6	0.0	10.1
82	15.1	13.0	16.7	13.0	0.0	13.3	9.5	12.4	0.0	10.3
83	17.1	13.5	16.8	13.3	0.0	13.8	9.5	12.0	0.0	10.7
84	17.3	13.9	16.6	13.0	0.0	14.2	10.4	12.6	0.0	10.9
85	18.7	14.3	17.2	15.5	0.0	14.5	13.1	13.3	16.9	13.7
86	15.5	14.7	17.6	17.0	0.0	14.9	14.2	12.2	0.0	11.8
87	15.4	15.0	18.2	17.9	0.0	15.2	14.9	12.2	0.0	12.1
88	15.4	14.6	18.4	18.6	0.0	15.5	14.7	12.7	0.0	12.2
89	15.6	15.0	18.3	19.2	0.0	15.8	14.4	13.2	0.0	12.4
90	15.9	15.2	16.5	19.1	0.0	16.1	15.1	13.9	15.2	14.1
91	14.1	15.4	17.4	16.5	0.0	16.3	14.6	13.3	0.0	12.0

Missing data (blanks) are due to equipment malfuntion.

Table AII-3 (cont.)

Cold Condition
Finger Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
92	13.4	15.6	17.1	14.4	0.0	15.7	13.6	13.2	0.0	11.4
93	13.9	15.8	14.7	16.5	0.0	15.7	13.3	13.7	0.0	11.5
94	14.7	15.8	15.3	17.2	0.0	15.8	13.3	14.0	0.0	11.8
95	14.2	15.8	16.5	16.4	0.0	15.8	15.1	13.7	14.4	13.5
96	13.8	14.7	17.2	14.5	0.0	15.8	13.9	13.8	0.0	11.5
97	13.8	13.7	16.6	13.7	0.0	15.3	14.8	13.2	0.0	11.2
98	12.8	12.7	16.0	12.5	0.0	15.5	14.4	12.2	0.0	10.7
99	11.6	12.2	15.2	11.2	0.0	15.5	13.1	11.9	0.0	10.1
100	11.7	12.2	14.4	9.1	0.0	15.1	12.2	10.7	11.3	10.7
101	11.3	12.1	13.4	11.3	0.0	14.5	11.4	12.0	0.0	9.6
102	11.1	11.8	13.8	11.0	0.0	13.2	10.5	12.2	0.0	9.3
103	10.2	11.5	12.2	11.9	0.0	12.7	11.1	11.8	0.0	9.0
104	10.6	11.6	12.1	10.8	0.0	12.5	11.4	11.1	0.0	8.9
105	11.0	11.6	12.9	10.2	0.0	12.8	10.8	11.0	8.0	9.8
106	11.6	10.9	12.5	12.0	0.0	12.3	10.2	10.8	0.0	8.9
107	12.5	10.9	12.2	13.8	0.0	12.0	10.2	11.2	0.0	9.2
108	11.6	11.3	12.3	12.4	0.0	12.3	12.0	10.9	0.0	9.2
109	11.5	11.6	11.7	13.9	0.0	12.5	12.7	11.6	0.0	9.5
110	10.8	12.2	12.9	15.8	0.0	12.7	13.4	13.2	10.0	11.2
111	14.6	12.6	14.6	16.8	0.0	12.8	13.8	15.1	0.0	11.1
112	15.0	13.3	15.7	16.8	0.0	13.0	14.0	16.3	0.0	11.6
113	14.3	14.0	15.7	17.1	0.0	13.4	14.3	16.9	0.0	11.7
114	13.9	14.4	15.0	16.1	0.0	14.0	15.2	17.3	0.0	11.8
115	14.2	14.5	15.0	16.7	0.0	14.5	15.6	17.5	13.3	13.5
116	14.8	14.2	15.4	17.5	0.0	14.9	15.8	17.7	0.0	12.3
117	14.8	14.7	15.8	17.9	0.0	15.4	16.1	17.9	0.0	12.5
118	14.4	15.0	16.1	18.5	0.0	15.8	16.1	17.9	0.0	12.6
119	14.6	15.2	15.8	19.3	0.0	16.2	15.7	18.2	0.0	12.8
120	15.1	15.5	14.6	20.1	0.0	16.5	15.9	18.5	14.6	14.5
121	13.7	15.5	12.1	18.9	0.0	16.8	14.1	17.8	0.0	12.1
122	13.1	15.0	11.6	15.9	0.0	16.3	13.0	15.4	0.0	11.1
123	13.3	15.3	13.9	14.8	0.0	15.0	13.5	16.0	0.0	11.3
124	13.9	15.4	12.7	14.2	0.0	15.0	13.5	16.4	0.0	11.2
125	13.4	15.5	12.5	16.4	0.0	15.3	14.8	16.4	15.9	13.4
126	12.9	14.6	13.4	17.0	0.0	15.4	14.7	15.7	0.0	11.5
127	12.7	15.8	14.1	17.6	0.0	15.3	13.8	16.0	0.0	11.7
128	13.5	14.8	12.4	17.6	0.0	15.8	13.3	16.3	0.0	11.5
129	11.6	13.1	11.6	16.0	0.0	14.3	13.6	16.5	0.0	10.7
130	11.4	11.8	10.7	17.2	0.0	13.3	11.8	16.1	12.9	11.7
131	10.9	12.0	10.1	17.6	0.0	12.7	10.5	15.5	0.0	9.9
132	11.6	12.2	9.0	16.6	0.0	11.9	11.1	14.5	0.0	9.7
133	12.0	12.0	8.9	16.6	0.0	12.2	10.6	12.4	0.0	9.4
134	11.6	11.8	10.2	13.5	0.0	12.4	0.0	13.0	0.0	8.1
135	11.2	11.7	10.0	13.0	0.0	12.9	0.0	13.2	11.7	9.3
136	12.7	11.9	10.1	11.1	0.0	12.9	0.0	13.1	0.0	8.0
137	13.6	12.1	10.2	11.7	0.0	12.5	0.0	12.9	0.0	8.1

Missing data (blanks) are due to equipment malfuntion.

Table AII-3 (cont.)

Cold Condition
Finger Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
138	11.7	12.4	11.1	9.9	0.0	12.5	0.0	11.7	0.0	7.7
139	14.4	12.8	12.8	12.3	0.0	12.8	11.0	13.1	0.0	9.9
140	16.3	13.2	13.8	14.5	0.0	11.8	12.6	14.6	11.5	12.0
141	17.0	13.6	13.9	13.8	0.0	11.9	13.6	15.7	0.0	11.1
142	17.3	14.0	15.8	13.9	0.0	12.5	14.3	16.3	0.0	11.6
143	16.1	14.4	17.1	13.2	0.0	13.2	14.8	16.9	0.0	11.7
144	17.6	14.3	17.3	12.1	0.0	14.0	15.4	17.1	0.0	12.0
145	18.2	14.6	18.2	14.0	0.0	14.9	15.8	17.1	15.2	14.2
146	18.3	14.9	18.9	15.9	0.0	15.7	16.2	17.1	0.0	13.0
147	18.1	15.2	19.1	16.5	0.0	16.4	16.5	16.9	0.0	13.2
148	15.5	15.5	18.9	17.6	0.0	17.0	16.8	17.2	0.0	13.2
149	15.8	15.2	19.3	18.3	0.0	17.5	17.1	17.5	0.0	13.4
150	16.0	15.3	17.5	18.8	0.0	17.9	16.8	17.8	15.8	15.1
151	14.0	15.5	15.4	17.3	0.0	18.4	14.1	16.1	0.0	12.3
152	14.2	15.8	14.8	15.1	0.0	18.4	13.4	14.9	0.0	11.8
153	14.5	16.0	13.8	16.5	0.0	16.7	13.4	15.4	0.0	11.8
154	15.3	16.0	11.9	18.0	0.0	17.2	14.8	15.8	0.0	12.1
155	14.1	16.8	13.6	18.3	0.0	17.4	14.9	15.7	16.3	14.1
156	14.2	15.0	14.6	17.5	0.0	17.4	13.2	15.3	0.0	11.9
157	13.8	13.6	14.2	17.1	0.0	16.5	12.3	15.7	0.0	11.5
158	13.2	11.9	14.5	15.0	0.0	17.4	11.2	15.6	0.0	11.0
159	12.6	11.7	14.0	13.8	0.0	17.6	10.7	14.8	0.0	10.6
160	11.3	12.6	13.4	11.5	0.0	15.9	10.7	14.3	14.4	11.6
161	11.8	12.7	12.3	10.1	0.0	15.3	11.6	12.5	0.0	9.6
162	12.3	12.4	11.5	12.8	0.0	13.6	10.8	12.4	0.0	9.5
163	11.2	12.4	10.8	13.2	0.0	12.4	10.9	13.5	0.0	9.4
164	10.8	12.5	11.4	13.5	0.0	12.2	10.2	13.4	0.0	9.3
165	10.8	12.3	11.1	13.7	0.0	12.3	9.7	13.2	12.6	10.6
166	14.1	12.6	11.0	12.7	0.0	12.1	11.0	13.4	0.0	9.7
167	14.6	13.0	10.8	12.5	0.0	11.5	13.1	13.3	0.0	9.9
168	13.7	13.4	11.6	12.5	0.0	11.4	14.4	14.0	0.0	10.1
169	13.7	13.8	11.8	14.8	0.0	11.7	15.1	15.0	0.0	10.7
170	13.6	14.2	12.4	16.6	0.0	11.9	15.9	15.4	11.0	12.3
171	14.5	14.5	14.6	17.7	0.0	12.0	16.5	15.5	0.0	11.7
172	15.0	14.9	16.4	18.0	0.0	12.6	17.0	15.8	0.0	12.2
173	16.3	15.2	17.7	17.9	0.0	13.4	17.3	15.7	0.0	12.6
174	17.0	15.6	18.4	18.7	0.0	14.5	17.6	15.8	0.0	13.1
175	16.2	15.9	18.9	19.3	0.0	15.5	17.9	15.9	13.5	14.8
176	14.5	16.2	19.1	18.1	0.0	16.3	16.8	14.7	0.0	12.9
177	13.8	16.5	19.3	15.0	0.0	16.6	13.6	15.8	0.0	12.3
178	13.4	16.7	17.3	16.9	0.0	15.1	12.9	16.7	0.0	12.1
179	12.3	16.7	15.5	17.0	0.0	15.7	14.0	17.0	0.0	12.0
180										

Missing data (blanks) are due to equipment malfuntion.

Table AII-3 (cont.)

SST Condition
Finger Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
0		32.2	29.0	33.3	26.4	34.2		33.6		31.5
1			28.3		26.6	34.1				29.7
2		27.7	27.1	23.8	27.9	33.0				27.9
3		27.1	26.0	23.6	28.0	31.0				27.1
4		26.7	24.2	23.4		30.7				26.3
5		26.3	22.8	22.7		30.3		29.6		26.3
6		25.3	21.1	22.0		28.9				24.3
7		24.5	19.9	20.6	18.4	27.0	22.2			22.1
8		23.0	18.9	20.0	17.6	24.7	23.0			21.2
9		21.3	19.0	20.2	15.7	23.0	22.3			20.3
10		19.3	18.0	18.9	14.4	21.8	21.8	16.8		18.7
11			17.4	17.5	16.4	21.8	19.9			18.6
12		16.8	16.7	16.7	18.1	20.7	18.5			17.9
13		16.9	15.7	15.8	17.3	19.2	17.4			17.1
14		16.6	14.8	14.5	17.0	18.1	16.2			16.2
15		15.5	13.8	13.4	16.0	18.0	15.0	15.2		15.3
16		15.5	12.7	12.3	14.6	16.9	13.9			14.3
17		15.8	12.0	11.3	14.6	17.8	14.5			14.3
18		16.3	13.1	11.5	16.5	18.0	14.2			14.9
19		17.1	13.4	12.9	17.8	17.8	14.4			15.6
20		17.2	12.9	13.6	18.7	18.0	14.0	19.3		16.2
21		17.4	12.7	14.2	19.2	17.6	14.7			16.0
22		17.7	12.8	14.2	19.5	17.0	15.5			16.1
23		18.0	12.7	13.7	19.7	16.7	15.9			16.1
24		18.3	12.7	13.3	19.9	16.1	16.4			16.1
25		17.9	13.1	13.5	20.0	16.1	17.1	18.7		16.6
26		18.1	13.9	13.7	20.2	16.6	17.3			16.6
27		18.2	15.0	14.1	20.5	17.3	18.0			17.2
28		18.0	15.2	15.0	20.7	17.0	18.8			17.5
29		18.4	15.2	15.6	20.9	17.0	19.1			17.7
30		18.9	14.5	16.1	19.5	17.6	19.3	21.8		18.2
31		18.1	15.5	15.8		16.9	19.1			17.1
32		18.2	14.4	16.1	16.6	14.8	18.8			16.5
33		18.4	13.1	15.2	17.5	16.2	18.8			16.5
34		18.7	12.3	15.5	18.9	16.7	18.9			16.8
35		18.9	11.6	15.8	17.6	16.4	19.1	16.0		16.5
36		19.1	10.8	16.1		14.9	19.2			16.0
37		17.6	10.3	16.5	15.1	14.1	19.2			15.5
38		16.5	10.4	15.4	13.1	13.8	18.2			14.6
39		15.2	9.9	14.9	11.9	13.3	17.0			13.7
40		14.6	9.3	14.7	11.8	12.8	16.0	13.0		13.2
41			8.8	13.4	12.0	12.3	14.6			12.2
42		12.6	8.4	12.2	12.3	12.7	15.0			12.2
43		12.2	8.5	10.8	12.8	13.0	15.0			12.1
44		11.7	8.8	10.5	13.3	12.3	14.6			11.9
45		10.8	9.0	10.2	12.9	12.5	14.7	16.1		12.3

Missing data (blanks) are due to equipment malfuntion.

Table AII-3 (cont.)

SST Condition
Finger Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
46		11.0	8.8	9.9	13.4	11.9	15.0			11.7
47		11.5	9.0	9.4		12.2	15.5			11.5
48		12.1	9.5	8.9	16.6	12.6	15.6			12.6
49		13.1	9.9	8.4	16.4	12.7	14.6			12.5
50		14.0	10.9	9.0	16.9	12.5	13.9	16.5		13.4
51		14.7	12.2	9.9	17.6	12.7	14.7			13.6
52		15.2	12.9	10.7	18.0	12.5	15.2			14.1
53		15.7	13.3	11.6	18.2	11.6	15.3			14.3
54		15.9	13.8	12.5	18.3	11.4	15.8			14.6
55		16.3	14.5	13.0	18.6	10.8	16.3	16.4		15.1
56		16.6	15.1	13.8	19.1	10.4	16.9			15.3
57		16.9	15.6	14.2	19.7	10.1	17.4			15.7
58		17.3	16.2	15.0	20.1	9.9	17.8			16.1
59		17.6	16.8	15.5	20.5	11.5	18.0			16.7
60		17.8	16.2	15.8	19.7	12.9	18.3	20.3		17.3
61		17.0	15.4	16.1		12.2	18.7			15.9
62		15.9	14.8	16.5	18.8	12.2	19.0			16.2
63		16.1	15.2	16.9	18.8	12.6	18.2			16.3
64		16.3	14.9	17.2	17.2	13.8	18.1			16.3
65		16.3	14.4	17.5	19.1	13.9	18.1	15.5		16.4
66		15.3	14.8	17.5	19.6	14.9	17.8			16.7
67		14.5	14.9	16.2	19.1	15.6	16.8			16.2
68		13.6	14.4	15.3	17.2	15.9	15.9			15.4
69		11.7	14.1	14.8	16.8	16.4	14.6			14.7
70		11.5	13.5	13.4	15.5	16.2	13.1	11.9		13.6
71		12.1	13.0	12.3	15.0	15.1	13.6			13.5
72		12.1	12.2	10.9	14.2	13.9	14.4			13.0
73		12.0	11.5	10.5	13.9	13.2	15.0			12.7
74		11.5	10.4	10.7	12.4	12.6	15.2			12.1
75		11.4	9.8	10.2	11.3	13.4	15.0	12.0		11.9
76		11.9	11.3	9.9	12.1	13.2	14.2			12.1
77		12.7	11.5	9.2	12.0	14.2	13.0			12.1
78		13.4	11.6	8.4	11.7	12.6	13.0			11.8
79		13.9	11.5	9.1	11.5	11.7	14.4			12.0
80		14.7	12.5	10.1	13.4	11.3	14.6	16.6		13.3
81		15.3	12.5	11.0	13.9	10.6	14.8			13.0
82		16.1	12.0	12.0	15.4	13.3	15.3			14.0
83		16.8	11.4	12.8	16.6	15.2	15.8			14.8
84		17.5	11.3	13.4	17.0	15.9	16.3			15.2
85		18.0	12.3	14.0	16.5	16.1	16.8	17.6		15.9
86		18.5	13.4	14.6	16.2	16.8	17.3			16.1
87		18.9	14.2	15.0	16.8	17.6	17.7			16.7
88		19.4	14.9	15.4	18.3	17.9	18.0			17.3
89		19.8	15.3	15.8	19.6	16.8	18.3			17.6
90		20.1	15.2	16.2	18.8	17.2	18.6	18.8		17.8
91		20.4	14.9	16.5		16.9	18.1			17.4

Missing data (blanks) are due to equipment malfuntion.

Table AII-3 (cont.)

SST Condition
Finger Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
92		20.7	13.6	16.8	16.7	16.7	17.9			17.1
93		20.7	12.4	17.1	18.2	17.2	17.8			17.2
94		18.7	11.6	17.5	18.6	16.6	17.9			16.8
95		19.0	11.8	17.1	18.2	17.1	18.0	12.3		16.2
96		19.1	12.6	16.6	16.6	17.3	17.5			16.6
97		19.1	11.9	15.5	16.6	16.6	16.2			16.0
98		18.0	11.4	13.9	15.0	14.5	14.9			14.6
99		16.8	10.9		14.4	14.0	13.3			13.9
100		15.7	10.0	10.9	14.4	13.5	12.7	11.5		12.7
101		14.7	10.3	11.3	15.2	14.4	13.9			13.3
102		13.3	10.3	11.4		14.2	13.3			12.5
103		12.5	9.4	11.1	11.3	12.3	13.1			11.6
104		12.1	8.8	10.4	11.6	11.7	12.4			11.2
105		12.3	8.8	9.8	12.3	13.2	12.7	10.9		11.4
106		11.6	9.0	10.4	11.4	12.9	14.0			11.6
107		11.8	9.2	10.9	10.9	12.9	14.3			11.7
108		11.4	9.2	11.4		14.4	14.8			12.2
109		10.9	9.5	12.3	14.7	13.2	15.4			12.7
110		11.0	9.0	13.0	14.7	12.4	15.9	15.9		13.1
111		11.6	8.5	13.6	15.2	12.6	16.5			13.0
112		13.0	8.6	14.2	16.4	13.6	16.9			13.8
113		14.3	9.7	14.9	17.2	15.1	17.3			14.8
114		15.0	10.7	15.4	17.7	16.7	17.7			15.5
115		15.4	11.3	15.9	17.4	16.9	18.0	18.0		16.1
116		15.7	12.1	16.3	16.9	16.8	18.4			16.0
117		15.8	12.3	16.7	16.8	17.6	18.9			16.4
118		16.0	12.1	17.0	16.8	18.4	19.3			16.6
119		16.2	11.6	17.3	17.1	18.2	19.7			16.7
120		16.2	12.0	17.6	16.7	17.9	20.1	18.8		17.0
121		14.3	11.7	17.8		18.2	19.8			16.4
122		14.3	10.4	18.0	12.4	16.8	19.0			15.2
123		14.6	9.9	18.2	13.7	15.2	17.6			14.9
124		14.8	10.4	18.3		16.2	17.5			15.4
125		14.9	9.9	17.7	16.5	17.0	17.8	16.0		15.7
126		15.2	8.7	16.4	15.2	17.3	17.9			15.1
127		15.1	9.3	15.6	14.6	17.1	16.9			14.8
128		13.8	9.9	14.3	14.1	17.1	15.8			14.2
129		12.9	9.6	12.9	13.2	15.0	15.1			13.1
130		12.0	10.1	11.0	11.8	14.3	13.5	14.3		12.4
131		11.9	8.7	11.0	10.2	12.6	13.2			11.3
132		10.5	8.1	11.6	11.8	13.8	12.8			11.4
133		10.8	8.0	12.3	12.3	12.7	12.1			11.4
134		10.3	8.8	12.1	11.9	13.7	11.8			11.4
135		10.4	9.4	11.6	11.1	13.1	12.6	12.1		11.5
136		9.8	8.9	11.5	11.5	12.0	13.2			11.2
137		9.6	8.8	11.6		11.2	13.9			11.0

Missing data (blanks) are due to equipment malfuntion.

Table AII-3 (cont.)

SST Condition
Finger Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
138		9.9	9.7	12.3	15.3	11.5	14.4			12.2
139		10.4	10.8	13.1	15.3	13.7	15.0			13.1
140		11.4	10.6	13.7	15.8	14.7	15.5	15.9		13.9
141		12.5	11.1	14.3	16.9	16.0	16.1			14.5
142		13.5	12.1	14.9	17.3	16.5	16.6			15.2
143		14.2	12.9	15.4	17.8	16.2	17.0			15.6
144		14.6	13.5	15.8	17.9	17.1	17.4			16.1
145		15.0	14.0	16.2	17.7	17.0	17.9	17.5		16.5
146		15.1	14.5	16.5	17.3	17.9	18.3			16.6
147		15.4	14.3	16.8	17.3	18.5	18.7			16.8
148		15.5	14.4	17.1	17.4	18.8	19.1			17.1
149		15.8	14.6	17.4	17.8	19.2	19.5			17.4
150		15.8	13.6	17.7	17.6	19.5	19.8	18.2		17.5
151		14.2	12.3	17.9	15.4	18.7	19.7			16.4
152		14.6	11.0	18.2	16.3	16.5	18.5			15.9
153		15.0	10.0	18.4	16.6	17.8	18.6			16.1
154		15.3	9.4	18.5	15.5	18.3	18.8			16.0
155		15.6	9.0	18.4	15.4	18.4	19.0	19.5		16.5
156		15.0	7.9	18.1	14.5	17.8	18.1			15.2
157		13.7	8.1	17.4	13.7	16.1	16.9			14.3
158		12.7	8.1	15.8	12.7	15.3	16.1			13.5
159		11.7	9.0	14.7		15.5	15.0			13.2
160		10.7	8.6	13.6	9.5	14.7	15.0	12.0		12.0
161		11.1	8.1	11.6	10.6	14.7	15.0			11.9
162		11.6	7.9	12.0	11.4	13.2	14.8			11.8
163		11.7	8.9	12.0	11.1	15.3	14.2			12.2
164		12.7	8.4	11.4	10.8	14.2	14.5			12.0
165		13.3	8.1	11.0	11.8	13.3	14.9	16.0		12.6
166		13.3	8.1	10.7	12.8	13.0	15.5			12.2
167		12.5	8.1	11.3	13.1	13.2	15.8			12.3
168		11.9	8.7	11.7	13.3	15.1	16.1			12.8
169		12.0	9.6	10.8	12.8	14.4	16.6			12.7
170		12.3	9.9	12.4	12.9	14.1	17.0	17.3		13.7
171		12.8	9.4	13.7	13.6	14.9	17.4			13.6
172		13.4	10.0	14.6	14.1	15.9	17.7			14.3
173		14.0	10.8		14.5	16.6	18.1			14.8
174		14.5	12.4		15.1	17.1	18.5			15.5
175		14.9	13.7	14.5	15.7	16.9	18.9	17.7		16.0
176	32.2	15.3	13.1		14.6	16.5	19.3			18.5
177		15.0	11.7		13.1	15.6	19.7			15.0
178	27.7	13.9	9.8		12.9	15.8	20.0			16.7
179	27.1				13.7	15.4	20.2			19.1

Missing data (blanks) are due to equipment malfuntion.

Table AII-4

Warm Condition
Face Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
0	33.7	33.8	35.5	37.8	37.3	34.2	36.5	35.1	32.9	35.2
1	33.3	33.6	34.7	36.4	37.0	34.0	36.2	35.0	0.0	31.1
2	32.3	32.8	33.9	34.2	36.0	33.3	35.4	34.3	0.0	30.2
3	31.4	32.0	33.0	33.1	35.6	32.5	34.7	33.6	0.0	29.5
4	30.6	31.2	32.1	32.3	35.3	31.8	34.2	33.0	0.0	28.9
5	30.1	30.5	31.5	31.6	35.0	31.1	33.7	32.6	30.8	31.9
6	29.5	29.8	30.8	31.7	33.9	30.3	33.2	32.1	0.0	27.9
7	29.1	29.2	30.2	31.4	32.0	29.5	32.7	31.5	0.0	27.3
8	30.0	28.7	29.7	30.9	31.0	29.0	32.3	31.1	0.0	27.0
9	28.2	28.3	29.2	30.6	30.5	28.4	31.9	31.1	0.0	26.5
10	27.7	28.0	28.6	30.0	30.0	27.9	31.3	30.6	28.8	29.2
11	27.2	27.9	28.1	29.7	32.3	27.5	30.9	30.2	0.0	26.0
12	26.7	27.5	27.9	29.7	33.0	27.1	30.6	29.6	0.0	25.8
13	26.2	27.3	27.5	28.9	33.1	26.6	30.4	29.2	0.0	25.5
14	25.8	27.1	27.3	28.1	32.6	26.2	30.2	28.8	0.0	25.1
15	25.6	26.9	27.0	27.8	29.0	25.9	30.0	28.6	27.4	27.6
16	25.3	26.6	26.7	27.5	31.3	25.5	29.8	28.5	0.0	24.6
17	25.1	26.4	26.3	27.2	30.8	25.1	29.6	28.2	0.0	24.3
18	25.0	26.1	26.0	27.0	30.4	24.8	29.2	28.0	0.0	24.1
19	24.9	25.9	25.6	26.7	30.1	24.4	28.8	27.8	0.0	23.8
20	24.7	25.5	25.2	26.3	29.8	24.2	28.5	27.6	26.6	26.5
21	24.6	25.3	24.9	25.8	27.3	24.0	28.1	27.2	0.0	23.0
22	24.4	25.2	24.6	25.6	28.0	23.9	28.0	27.0	0.0	23.0
23	24.3	25.0	24.4	25.4	27.2	23.7	27.8	26.8	0.0	22.7
24	24.2	24.7	24.1	25.2	28.5	23.5	27.6	26.7	0.0	22.7
25	23.9	24.4	23.9	25.0	28.2	23.3	27.4	26.4	25.9	25.4
26	23.7	24.3	23.8	24.4	27.9	23.2	27.2	26.2	0.0	22.3
27	23.5	24.1	23.7	24.0	27.6	23.1	27.0	25.9	0.0	22.1
28	23.5	24.0	23.6	23.6	27.5	23.0	26.7	25.7	0.0	22.0
29	23.3	23.9	23.5	23.2	27.2	22.8	26.5	25.5	0.0	21.8
30	23.1	23.8	23.4	22.9	27.0	22.7	26.3	25.4	25.0	24.4
31	22.7	23.7	23.2	22.7	27.0	22.6	26.0	25.3	0.0	21.5
32	22.6	23.5	23.2	22.6	26.7	22.5	26.0	25.3	0.0	21.4
33	22.8	23.5	23.2	22.2	0.0	22.5	26.1	25.3	0.0	18.4
34	23.0	23.4	23.1	21.9	0.0	22.6	26.1	25.5	0.0	18.4
35	23.1	23.4	23.0	21.8	0.0	22.6	26.1	25.6	24.6	21.1
36	23.1	23.5	22.8	21.7	0.0	22.5	25.9	25.5	0.0	18.3
37	23.3	23.3	22.7	21.8	0.0	22.4	25.6	25.4	0.0	18.3
38	23.2	23.2	22.6	21.9	0.0	22.2	25.5	25.3	0.0	18.2
39	24.1	23.1	22.4	21.4	0.0	22.0	25.4	25.3	0.0	18.2
40	23.4	23.1	22.3	20.8	0.0	21.8	25.3	25.2	23.4	20.6
41	22.9	22.9	22.1	20.6	0.0	21.7	25.1	25.1	0.0	17.8
42	22.8	23.0	21.7	20.5	0.0	21.7	25.0	25.0	0.0	17.7
43	22.6	23.0	21.7	20.6	0.0	21.6	25.0	24.8	0.0	17.7
44	22.5	22.9	21.9	20.5	0.0	21.6	24.8	24.7	0.0	17.7
45	22.5	22.8	21.8	20.2	0.0	21.6	24.8	24.6	23.6	20.2

Missing data (blanks) are due to equipment malfuntion.

Table AII-4 (cont.)

Warm Condition
Face Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
46	22.4	22.9	21.7	20.0	0.0	21.5	24.8	24.2	0.0	17.5
47	22.3	22.8	21.6	19.9	0.0	21.3	24.8	24.1	0.0	17.4
48	22.3	22.7	21.5	19.8	0.0	21.3	24.8	24.1	0.0	17.4
49	22.3	22.6	21.3	19.8	0.0	21.3	24.7	24.1	0.0	17.3
50	22.2	22.7	21.2	19.7	0.0	21.3	24.7	23.9	23.0	19.9
51	22.0	22.8	21.1	19.4	0.0	21.2	24.7	23.9	0.0	17.2
52	21.9	22.9	21.0	19.0	0.0	21.2	24.7	23.9	0.0	17.2
53	21.8	23.0	20.9	19.0	0.0	21.1	24.6	23.9	0.0	17.1
54	21.8	23.0	20.9	18.9	0.0	21.1	24.4	24.0	0.0	17.1
55	21.9	22.9	21.1	18.9	0.0	21.0	24.4	23.9	22.5	19.6
56	21.9	22.9	21.1	18.9	0.0	20.9	24.4	23.8	0.0	17.1
57	21.9	22.9	21.1	18.9	0.0	20.9	24.4	23.8	0.0	17.1
58	22.0	22.8	21.0	18.7	0.0	20.9	24.3	23.6	0.0	17.0
59	21.8	22.7	20.8	18.6	0.0	21.0	24.3	23.5	0.0	17.0
60	21.7	22.7	20.9	18.6	0.0	21.0	24.2	23.3	22.9	19.5
61	21.6	22.6	20.9	18.5	0.0	21.1	24.1	23.2	0.0	16.9
62	21.9	22.4	21.0	18.6	0.0	21.1	24.1	23.2	0.0	16.9
63	22.1	22.5	21.1	18.6	0.0	21.0	24.4	23.2	0.0	17.0
64	22.1	22.6	21.3	18.8	0.0	21.0	24.5	23.2	0.0	17.1
65	22.0	22.6	21.3	18.8	0.0	21.1	24.5	23.2	22.8	19.6
66	22.2	22.4	21.3	18.7	0.0	21.3	24.5	23.2	0.0	17.1
67	22.4	22.1	21.1	18.6	0.0	21.3	24.3	23.1	0.0	17.0
68	22.5	22.0	21.0	18.5	0.0	21.4	24.2	23.1	0.0	17.0
69	22.1	21.9	21.0	18.5	0.0	21.3	24.1	22.9	0.0	16.9
70	21.9	21.8	20.8	18.6	0.0	21.2	23.9	23.0	22.6	19.3
71	21.9	21.7	20.6	18.5	0.0	21.1	23.8	23.2	0.0	16.8
72	21.9	21.8	20.6	18.3	0.0	21.0	23.7	23.5	0.0	16.8
73	21.9	21.8	20.7	18.3	0.0	21.0	23.7	23.8	0.0	16.8
74	21.8	21.6	20.6	18.3	0.0	20.8	23.7	24.4	0.0	16.8
75	21.8	21.7	20.6	18.1	0.0	20.7	23.7	24.5	22.3	19.3
76	21.8	21.7	20.7	17.9	0.0	20.7	23.7	24.6	0.0	16.8
77	21.8	21.9	20.7	17.9	0.0	20.7	23.9	24.4	0.0	16.8
78	21.8	22.0	20.7	17.8	0.0	20.6	24.0	24.2	0.0	16.8
79	21.8	22.0	20.6	17.7	0.0	20.7	24.1	24.1	0.0	16.8
80	21.7	22.0	20.5	17.5	0.0	20.7	24.1	23.9	22.6	19.2
81	21.4	21.9	20.5	18.0	0.0	20.7	24.1	23.9	0.0	16.7
82	21.3	21.8	20.5	18.0	0.0	20.7	24.1	23.9	0.0	16.7
83	21.4	21.8	20.4	17.9	0.0	20.7	24.1	23.9	0.0	16.7
84	21.5	21.8	20.4	17.8	0.0	20.7	24.1	23.7	0.0	16.7
85	21.6	21.9	20.3	17.5	0.0	20.6	24.0	23.6	22.4	19.1
86	21.6	22.0	20.3	17.3	0.0	20.5	23.9	23.6	0.0	16.6
87	21.7	22.0	20.4	17.1	0.0	20.4	23.8	23.6	0.0	16.6
88	21.9	21.9	20.5	17.1	0.0	20.3	23.9	23.5	0.0	16.6
89	22.0	21.8	20.6	17.0	0.0	20.2	23.9	23.6	0.0	16.6
90	22.1	21.8	20.7	16.9	0.0	20.1	23.9	23.7	22.4	19.1
91	22.1	22.1	20.7	16.9	0.0	19.9	24.0	23.7	0.0	16.6

Missing data (blanks) are due to equipment malfuntion.

Table AII-4 (cont.)

Warm Condition
Face Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
92	22.2	22.3	20.7	17.1	0.0	19.8	24.0	23.9	0.0	16.7
93	22.4	22.4	20.7	17.1	0.0	19.9	24.1	24.1	0.0	16.7
94	22.5	22.4	21.0	17.1	0.0	20.2	24.2	24.4	0.0	16.9
95	22.4	22.3	21.0	17.2	0.0	20.4	24.2	24.6	23.3	19.5
96	22.5	22.2	21.0	17.3	0.0	20.6	24.0	24.8	0.0	16.9
97	22.5	22.2	21.1	17.6	0.0	20.4	23.8	24.6	0.0	16.9
98	22.6	22.2	20.9	17.5	0.0	20.4	23.8	24.4	0.0	16.9
99	22.2	22.2	20.9	17.5	0.0	20.3	23.7	24.2	0.0	16.8
100	22.3	22.1	20.7	17.4	0.0	20.4	23.7	24.1	23.0	19.3
101	22.7	22.2	20.6	17.2	0.0	20.4	23.8	24.1	0.0	16.8
102	22.7	22.1	20.5	17.1	0.0	20.3	23.8	24.2	0.0	16.7
103	22.4	22.2	20.3	16.8	0.0	20.3	23.8	24.2	0.0	16.7
104	22.2	22.4	20.3	16.6	0.0	20.2	23.8	24.1	0.0	16.6
105	22.1	22.5	20.4	16.9	0.0	20.2	23.9	24.2	22.2	19.2
106	22.0	22.4	20.3	17.3	0.0	20.1	23.9	24.1	0.0	16.7
107	22.0	22.4	20.4	17.6	0.0	20.0	24.0	24.0	0.0	16.7
108	21.9	22.5	20.5	18.0	0.0	19.9	24.0	23.9	0.0	16.7
109	21.9	22.5	20.5	17.8	0.0	19.9	23.9	23.8	0.0	16.7
110	22.0	22.4	20.4	17.7	0.0	19.9	23.9	23.8	22.5	19.2
111	22.2	22.3	20.4	17.6	0.0	20.0	23.8	23.7	0.0	16.7
112	22.3	22.2	20.4	17.4	0.0	20.0	23.9	23.7	0.0	16.7
113	22.3	22.2	20.3	17.2	0.0	19.9	24.0	23.7	0.0	16.6
114	22.3	22.2	20.3	17.1	0.0	19.8	24.0	23.5	0.0	16.6
115	22.3	22.2	20.3	17.0	0.0	19.8	24.1	23.4	22.5	19.1
116	22.2	22.2	20.4	16.9	0.0	19.8	24.4	23.3	0.0	16.6
117	22.2	22.2	20.4	16.7	0.0	19.9	24.4	23.1	0.0	16.5
118	22.2	22.2	20.3	16.5	0.0	20.0	24.4	23.1	0.0	16.5
119	22.3	22.2	20.3	16.4	0.0	20.1	24.4	23.1	0.0	16.5
120	22.2	22.3	20.3	16.3	0.0	20.1	24.4	23.1	22.4	19.0
121	22.1	22.5	20.3	16.2	0.0	20.0	24.3	23.1	0.0	16.5
122	22.2	22.8	20.4	16.2	0.0	20.0	24.3	23.1	0.0	16.6
123	22.4	23.0	20.5	16.1	0.0	20.1	24.4	23.3	0.0	16.6
124	22.5	23.1	20.7	16.2	0.0	20.2	24.4	23.4	0.0	16.7
125	22.5	23.1	20.9	16.2	0.0	20.5	24.4	23.7	22.5	19.3
126	22.4	23.0	21.0	16.2	0.0	20.6	24.4	23.7	0.0	16.8
127	22.4	23.2	21.1	16.4	0.0	20.6	24.3	23.7	0.0	16.9
128	22.3	23.2	21.0	16.9	0.0	20.7	24.2	23.8	0.0	16.9
129	22.3	23.2	21.0	16.9	0.0	20.5	24.1	23.9	0.0	16.9
130	21.8	23.1	21.0	17.0	0.0	20.4	23.9	23.9	23.0	19.3
131	21.7	23.2	20.6	17.0	0.0	20.3	23.9	23.8	0.0	16.7
132	21.8	23.2	20.4	17.0	0.0	20.3	23.8	23.8	0.0	16.7
133	21.8	23.1	20.4	17.0	0.0	20.2	23.9	23.6	0.0	16.7
134	21.8	23.0	20.5	17.1	0.0	20.0	23.9	23.6	0.0	16.7
135	21.9	22.9	20.5	17.3	0.0	19.9	23.9	23.7	22.2	19.1
136	21.9	22.9	20.4	17.3	0.0	19.8	23.9	23.7	0.0	16.7
137	21.8	22.9	20.5	17.1	0.0	19.9	23.9	23.6	0.0	16.6

Missing data (blanks) are due to equipment malfuntion.

Table AII-4 (cont.)

Warm Condition
Face Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
138	21.8	22.8	20.7	17.1	0.0	20.0	23.9	23.8	0.0	16.7
139	21.7	22.8	20.7	17.3	0.0	20.1	23.8	23.8	0.0	16.7
140	21.8	22.8	20.6	17.5	0.0	20.2	23.8	23.8	22.4	19.2
141	21.7	22.8	20.5	17.8	0.0	20.3	23.8	23.7	0.0	16.7
142	21.7	22.7	20.5	17.6	0.0	20.2	23.9	23.6	0.0	16.7
143	21.8	22.7	20.5	17.5	0.0	20.1	24.0	23.5	0.0	16.7
144	21.9	22.6	20.4	17.5	0.0	20.1	24.1	23.5	0.0	16.7
145	22.0	22.6	20.3	17.6	0.0	20.0	24.2	23.4	21.9	19.1
146	22.0	22.6	20.3	17.6	0.0	19.9	24.3	23.2	0.0	16.7
147	21.9	22.6	20.3	17.7	0.0	19.9	24.4	23.1	0.0	16.7
148	21.8	22.7	20.3	17.7	0.0	19.8	24.5	23.0	0.0	16.6
149	21.8	22.8	20.3	17.5	0.0	19.8	24.5	22.9	0.0	16.6
150	21.7	22.9	20.4	17.5	0.0	19.7	24.4	22.9	22.9	19.2
151	21.6	22.8	20.6	17.5	0.0	19.8	24.2	22.8	0.0	16.6
152	21.8	22.7	20.5	17.5	0.0	19.8	24.3	23.0	0.0	16.6
153	22.1	22.7	20.4	17.5	0.0	19.9	24.3	23.2	0.0	16.7
154	22.2	22.6	20.6	17.5	0.0	20.2	24.3	23.4	0.0	16.8
155	22.3	22.6	20.8	17.6	0.0	20.3	24.3	23.6	24.0	19.5
156	22.6	22.4	20.9	17.6	0.0	20.4	24.2	23.7	0.0	16.9
157	23.0	22.4	20.8	17.6	0.0	20.5	24.0	23.9	0.0	16.9
158	23.3	22.2	20.7	18.0	0.0	20.5	23.9	24.0	0.0	17.0
159	22.7	22.2	20.8	17.9	0.0	20.6	23.8	23.8	0.0	16.9
160	22.5	22.2	20.8	17.7	0.0	20.5	23.8	23.7	23.6	19.4
161	22.5	22.1	20.7	17.5	0.0	20.4	23.8	23.6	0.0	16.7
162	22.5	22.0	20.5	17.4	0.0	20.3	23.9	23.6	0.0	16.7
163	22.4	22.0	20.4	17.3	0.0	20.3	23.9	23.6	0.0	16.7
164	22.4	22.1	20.5	17.3	0.0	20.2	23.9	23.6	0.0	16.7
165	22.3	22.1	20.5	17.1	0.0	20.3	23.9	23.6	22.8	19.2
166	22.2	22.0	20.4	16.9	0.0	20.1	23.8	23.7	0.0	16.6
167	22.1	22.0	20.4	17.0	0.0	20.1	23.9	23.7	0.0	16.6
168	21.9	22.0	20.3	17.2	0.0	20.0	23.9	23.7	0.0	16.6
169	21.8	22.0	20.2	17.1	0.0	19.9	24.1	23.7	0.0	16.5
170	21.7	21.9	20.4	16.9	0.0	19.8	24.2	23.7	22.3	19.0
171	21.7	21.9	20.3	16.7	0.0	20.0	24.3	23.6	0.0	16.5
172	21.7	21.8	20.3	16.8	0.0	20.0	24.4	23.4	0.0	16.5
173	21.8	21.8	20.2	17.2	0.0	20.1	24.4	23.3	0.0	16.5
174	21.9	21.7	20.2	17.4	0.0	20.2	24.3	23.2	0.0	16.5
175	21.9	21.8	20.2	17.4	0.0	20.2	24.3	23.1	22.3	19.0
176	21.9	22.0	20.1	17.5	0.0	20.2	24.2	23.2	0.0	16.6
177	22.1	22.1	20.1	17.5	0.0	20.2	24.1	23.5	0.0	16.6
178	22.3	22.1	20.1	17.3	0.0	20.2	24.2	23.7	0.0	16.7
179	22.5	22.1	20.0	17.3	0.0	20.4	24.2	23.9	0.0	16.7

Missing data (blanks) are due to equipment malfuntion.

Table AII-4 (cont.)

Cold Condition
Face Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
0	35.9	35.2	33.3	34.8	34.1	32.4	33.8	35.0	34.1	34.3
1	35.8	35.1	33.2	34.7	33.9	32.3	33.9	35.0	34.0	34.2
2	35.7	35.0	33.1	34.6	33.8	32.2	33.2	35.0	33.9	34.1
3	35.6	34.9	33.1	34.6	33.5	32.1	33.8	34.9	34.0	34.1
4	35.5	34.9	33.2	34.5	33.3	32.0	33.8	34.7	34.1	34.0
5	35.6	35.0	34.3	34.3	33.2	31.9	33.5	34.5	34.1	34.0
6	35.6	35.1	34.1	34.1	34.0	32.1	33.4	34.6	34.2	34.1
7	35.6	35.4	34.1	34.1	34.8	32.4	33.2	34.4	34.2	34.2
8	35.6	35.1	33.8	34.1	34.7	32.3	32.8	34.4	34.1	34.1
9	35.5	35.0	32.9	34.1	34.3	32.2	32.7	34.4	34.0	33.9
10	35.3	34.9	32.6	34.1	33.7	31.8	33.9	34.5	33.7	33.8
11	35.3	35.0	33.0	34.1	34.0	31.8	32.9	34.6	33.5	33.8
12	35.1	34.8	33.4	34.0	33.4	31.7	33.6	34.3	33.5	33.8
13	35.2	34.6	33.3	33.9	33.5	31.7	33.7	33.8	33.7	33.7
14	35.2	34.5	33.6	33.7	33.5	31.7	33.3	33.6	33.8	33.7
15	35.3	34.5	33.7	33.6	33.6	31.6	32.6	33.3	33.8	33.6
16	35.3	34.7	33.8	33.6	33.7	31.7	33.0	33.5	33.8	33.7
17	35.3	34.6	33.8	33.9	33.8	31.7	32.6	33.8	33.7	33.7
18	35.2	34.5	33.7	34.0	33.8	31.9	33.1	33.8	33.6	33.7
19	35.2	34.4	33.8	34.0	33.8	31.9	33.0	33.6	33.6	33.7
20	35.2	34.1	33.8	34.1	33.6	31.7	33.4	33.8	33.6	33.7
21	35.2	34.1	33.9	34.0	33.6	31.6	33.4	33.8	33.8	33.7
22	35.1	33.9	34.0	33.9	33.6	31.5	33.2	33.7	34.0	33.7
23	35.3	34.1	34.2	33.8	33.7	31.4	33.1	33.8	34.0	33.7
24	35.4	34.3	34.3	33.9	33.8	31.4	33.0	34.0	34.0	33.8
25	35.4	34.4	34.2	34.0	33.9	31.5	32.9	34.1	33.9	33.8
26	35.4	34.3	34.2	34.2	34.0	31.6	32.8	34.0	33.8	33.8
27	35.3	34.2	34.2	34.1	34.0	31.9	32.7	33.9	33.6	33.8
28	35.2	34.1	34.1	34.1	33.9	31.4	33.0	33.7	33.5	33.7
29	35.0	34.0	34.2	34.0	33.8	31.3	33.0	33.4	33.4	33.6
30	35.0	34.0	34.3	33.9	33.8	31.1	32.8	33.2	33.4	33.5
31	35.1	34.0	34.6	33.7	33.7	31.0	32.9	33.3	33.6	33.5
32	35.2	34.2	34.7	33.7	33.8	31.0	32.2	33.4	33.6	33.5
33	35.3	34.3	34.7	33.9	33.9	31.0	32.1	33.7	33.6	33.6
34	35.3	34.3	34.7	34.0	34.0	31.1	32.4	33.8	33.7	33.7
35	35.1	34.3	34.6	34.1	34.1	31.2	32.8	33.9	33.6	33.7
36	35.2	34.3	34.7	34.0	35.2	31.4	32.9	33.7	33.5	33.9
37	34.9	34.2	34.6	33.9	35.2	31.3	33.2	33.2	33.5	33.8
38	34.9	34.1	34.6	33.8	34.9	31.3	33.1	32.9	33.8	33.7
39	34.9	34.1	34.5	37.4	33.5	31.5	32.5	32.7	33.6	33.9
40	35.0	34.2	34.6	33.8	33.6	31.0	33.0	32.7	33.7	33.5
41	35.1	34.4	34.7	33.7	33.7	31.2	32.8	32.8	33.4	33.5
42	35.0	34.5	34.9	33.4	33.8	31.2	32.7	33.0	33.3	33.5
43	35.0	34.5	36.3	33.3	33.8	31.2	32.5	33.1	33.2	33.7
44	34.9	34.6	36.4	33.3	33.8	31.2	32.5	33.2	33.1	33.7
45	34.9	34.5	35.5	33.4	33.9	31.2	32.8	32.9	33.1	33.6

Missing data (blanks) are due to equipment malfuntion.

Table AII-4 (cont.)

Cold Condition
Face Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
46	34.8	34.3	34.4	33.5	33.6	31.5	32.8	32.7	33.1	33.4
47	34.8	34.1	34.3	33.5	33.5	31.0	32.1	32.5	33.3	33.2
48	34.9	33.8	34.5	33.6	33.5	30.8	32.6	32.5	33.3	33.3
49	34.9	33.9	34.3	33.6	33.5	30.8	32.7	32.7	33.4	33.3
50	35.0	34.0	34.3	33.5	33.5	30.8	32.5	33.0	33.3	33.3
51	34.9	34.2	34.4	33.4	33.7	30.9	32.4	33.1	33.2	33.4
52	34.8	34.3	34.5	33.3	33.7	31.0	32.5	33.1	33.1	33.4
53	34.8	34.3	34.4	33.4	33.8	31.0	32.5	33.1	32.9	33.4
54	34.6	34.2	34.3	33.4	33.8	30.9	32.6	32.9	32.9	33.3
55	34.5	34.2	34.4	33.5	33.7	30.8	32.6	32.7	33.0	33.3
56	34.6	34.2	34.4	33.6	33.7	30.7	32.6	32.6	33.1	33.3
57	34.8	34.3	34.4	33.8	33.6	30.6	32.5	32.5	33.1	33.3
58	34.8	34.3	34.4	33.7	33.6	30.6	32.3	32.6	33.1	33.3
59	34.9	34.5	34.4	33.7	33.7	30.6	32.3	32.8	33.0	33.3
60	34.8	34.6	34.4	33.5	33.8	30.7	32.3	33.0	37.1	33.8
61	34.8	34.6	34.4	33.3	33.9	30.8	32.4	33.0	33.0	33.4
62	34.7	34.6	34.3	33.3	33.9	30.8	32.5	33.2	33.0	33.4
63	34.6	34.5	34.2	33.3	34.0	30.8	32.4	33.1	33.1	33.3
64	34.5	34.5	34.3	33.5	33.9	30.9	32.5	33.1	33.0	33.4
65	34.6	34.5	34.3	33.5	33.8	31.0	32.4	33.0	32.9	33.3
66	34.7	34.6	34.3	33.5	33.8	31.2	32.4	32.9	32.9	33.4
67	34.8	34.7	34.3	33.5	33.8	31.4	32.4	32.7	33.1	33.4
68	34.9	34.7	34.4	33.3	33.8	31.0	32.5	32.6	33.0	33.4
69	34.8	34.6	34.4	33.3	33.8	31.0	32.2	32.5	33.0	33.3
70	34.6	34.4	35.0	33.1	33.9	31.1	32.2	32.3	32.9	33.3
71	34.5	34.3	35.4	33.2	33.8	31.2	32.5	32.3	32.7	33.3
72	34.4	34.1	35.1	33.3	33.7	31.1	32.6	32.2	32.6	33.2
73	34.4	34.1	34.2	33.4	34.6	31.0	32.5	32.2	32.5	33.2
74	34.6	34.1	33.8	33.5	34.0	30.9	32.5	32.2	32.4	33.1
75	34.5	34.0	33.8	33.5	33.6	30.8	32.5	32.3	32.4	33.0
76	34.5	34.0	33.8	33.4	33.2	30.8	32.4	32.4	32.6	33.0
77	34.7	34.0	33.8	33.3	32.9	30.8	32.4	32.5	32.7	33.0
78	34.7	33.9	33.8	33.3	32.9	30.9	32.4	32.5	32.8	33.0
79	34.5	34.1	33.9	33.4	33.0	31.0	32.4	32.4	32.8	33.1
80	34.4	34.1	33.8	33.6	33.0	30.9	32.5	32.2	32.8	33.0
81	34.3	33.9	33.8	33.8	32.9	30.9	32.6	32.2	32.8	33.0
82	34.3	33.8	33.7	33.8	32.9	30.8	32.4	32.2	32.6	32.9
83	34.4	33.9	33.7	33.8	32.7	30.8	32.4	32.4	32.6	33.0
84	34.5	34.0	33.8	33.7	32.7	30.7	32.2	32.6	32.5	33.0
85	34.6	34.3	33.9	33.6	32.7	30.7	32.2	32.7	32.9	33.1
86	34.6	34.4	33.9	33.4	32.8	30.7	32.2	32.7	33.0	33.1
87	34.6	34.5	34.0	33.4	32.9	30.9	32.3	32.8	33.0	33.2
88	34.4	34.6	33.9	33.5	32.9	31.1	32.4	32.7	33.0	33.2
89	34.3	34.5	33.8	33.8	32.9	31.3	32.3	32.5	32.9	33.1
90	34.4	34.4	33.7	33.9	32.9	31.3	32.3	32.1	32.8	33.1
91	34.4	34.3	33.8	33.9	32.9	31.2	32.5	32.0	32.6	33.1

Missing data (blanks) are due to equipment malfuntion.

Table AII-4 (cont.)

Cold Condition
Face Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
92	34.5	34.2	33.8	33.7	32.9	31.1	32.3	32.1	32.8	33.0
93	34.6	34.3	33.8	33.6	32.9	31.0	32.2	32.5	32.9	33.1
94	34.6	34.5	33.8	33.4	32.9	31.0	32.3	32.7	32.9	33.1
95	34.6	34.7	33.9	33.3	33.1	31.1	32.3	32.7	32.9	33.2
96	34.6	34.8	34.4	33.3	33.8	31.3	32.4	32.7	32.8	33.3
97	34.4	34.7	34.9	33.4	33.9	31.3	32.7	32.5	32.6	33.4
98	34.3	34.3	34.4	33.5	33.3	31.2	32.8	32.3	32.4	33.2
99	34.2	34.0	33.9	33.6	32.9	31.2	32.6	32.0	32.3	33.0
100	34.2	34.1	33.4	33.6	32.9	31.1	32.2	31.8	32.3	32.8
101	34.3	34.1	33.4	33.5	32.9	30.9	32.2	31.8	32.4	32.8
102	34.3	34.1	33.5	33.4	32.8	30.9	32.3	32.0	32.5	32.9
103	34.2	34.2	33.5	33.3	32.9	30.9	32.5	32.0	32.6	32.9
104	34.2	34.3	37.1	33.4	33.0	30.9	32.4	31.8	32.7	33.3
105	34.0	34.3	33.5	33.5	33.1	31.0	32.5	31.6	32.6	32.9
106	33.9	34.3	33.5	33.8	33.1	31.0	32.5	31.6	32.2	32.9
107	33.9	34.2	33.4	33.9	33.1	31.0	32.4	31.6	32.3	32.9
108	33.9	34.2	33.4	33.9	33.1	30.9	32.2	31.4	32.4	32.8
109	34.2	34.1	34.5	33.8	32.7	30.8	32.2	31.4	32.5	32.9
110	34.2	34.2	33.7	33.7	32.7	30.7	32.2	31.7	32.7	32.9
111	34.2	34.2	33.7	33.5	32.7	30.6	32.3	32.0	32.6	32.9
112	34.1	34.3	33.7	33.4	32.7	30.6	32.3	32.0	32.7	32.9
113	34.0	34.4	33.7	33.4	32.9	30.7	32.2	32.0	32.8	32.9
114	33.9	34.4	33.6	33.5	33.0	30.7	32.1	31.9	32.7	32.9
115	33.8	34.4	33.5	33.7	33.1	30.7	32.1	32.0	32.7	32.9
116	33.8	34.2	33.4	33.8	33.1	30.6	32.0	31.8	32.7	32.8
117	33.8	34.2	33.4	33.8	33.1	30.6	31.9	31.8	32.8	32.8
118	33.9	34.2	33.4	33.8	33.1	30.5	31.9	31.8	32.8	32.8
119	34.0	34.2	33.3	33.8	33.1	30.4	32.0	32.2	32.9	32.9
120	34.0	34.3	33.3	33.7	33.1	30.4	31.9	32.3	32.9	32.9
121	34.0	34.4	33.5	33.5	33.2	30.4	31.9	32.3	33.1	32.9
122	34.0	34.5	33.6	33.5	33.4	30.6	32.0	32.3	32.8	33.0
123	34.0	34.6	33.6	33.5	33.5	30.7	32.0	32.4	32.8	33.0
124	33.9	34.5	33.5	33.6	33.5	30.7	31.9	32.3	32.5	32.9
125	33.9	34.4	33.5	33.5	33.5	30.7	31.9	32.2	32.2	32.9
126	33.8	33.8	33.9	33.5	34.0	30.7	32.0	32.2	32.4	32.9
127	33.8	33.8	33.9	33.6	33.8	31.0	32.0	32.1	32.5	32.9
128	33.8	33.9	34.0	33.4	33.9	30.6	31.9	31.9	32.6	32.9
129	33.8	34.0	33.8	33.4	33.0	30.6	32.4	32.1	32.7	32.9
130	33.8	34.1	33.2	33.4	32.9	30.6	32.2	31.8	32.7	32.7
131	33.8	34.1	33.2	33.4	33.0	30.6	32.2	31.7	32.7	32.7
132	33.6	34.1	33.2	33.6	32.9	30.7	32.1	31.5	32.5	32.7
133	33.5	34.1	33.3	33.6	32.9	30.7	32.2	31.4	32.6	32.7
134	33.4	33.9	33.1	33.6	32.9	30.7	32.0	31.5	32.6	32.6
135	33.4	33.8	33.1	33.6	32.8	30.7	31.9	31.6	32.6	32.6
136	33.5	33.8	33.1	33.7	32.8	30.5	32.1	31.7	32.6	32.6
137	33.7	33.9	33.1	33.5	32.7	30.4	32.1	31.9	32.7	32.7

Missing data (blanks) are due to equipment malfuntion.

Table AII-4 (cont.)

Cold Condition
Face Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
138	33.8	34.0	33.2	33.5	32.8	30.4	32.2	31.9	33.0	32.8
139	33.8	34.1	33.3	33.4	32.9	30.4	32.3	31.9	32.8	32.8
140	33.8	34.2	33.3	33.5	33.1	30.5	32.3	32.0	32.8	32.8
141	33.6	34.5	33.3	33.7	33.1	30.5	32.1	32.3	32.8	32.9
142	33.5	34.1	33.2	33.7	33.1	30.5	32.2	32.6	32.8	32.9
143	33.5	34.1	33.1	33.7	33.2	30.5	32.3	33.0	32.8	32.9
144	33.6	34.0	32.9	33.7	33.5	30.6	32.1	33.2	33.1	33.0
145	33.6	33.9	32.9	33.5	33.5	30.5	32.0	33.3	33.1	32.9
146	33.8	34.0	33.0	33.5	32.8	30.4	32.0	33.1	33.0	32.8
147	33.8	34.0	33.0	33.5	32.9	30.4	32.1	33.0	33.0	32.9
148	33.8	34.2	33.1	33.6	32.9	30.5	32.1	33.0	32.9	32.9
149	33.7	34.1	33.2	33.6	33.0	30.6	32.0	32.8	32.8	32.9
150	33.6	34.1	33.1	33.7	33.0	30.6	32.0	32.7	32.8	32.8
151	33.6	34.0	33.1	33.5	33.0	30.7	31.9	32.9	32.8	32.8
152	33.6	34.0	33.1	33.5	33.0	30.7	31.9	33.1	32.8	32.9
153	33.7	34.0	33.0	33.2	32.9	30.9	31.8	33.2	32.5	32.8
154	33.8	34.0	32.9	33.0	32.8	30.8	31.9	33.1	32.5	32.8
155	33.9	34.1	33.0	33.0	32.8	30.5	32.0	32.7	32.4	32.7
156	33.9	34.2	33.4	33.1	33.1	30.5	32.1	32.3	32.4	32.8
157	33.8	34.5	34.5	33.2	33.2	30.6	32.1	31.9	32.3	32.9
158	33.8	34.1	33.4	33.3	33.5	30.7	32.2	31.7	32.3	32.8
159	33.5	34.0	33.3	33.3	33.4	30.7	32.1	31.6	32.5	32.7
160	33.5	33.8	33.3	33.3	32.9	30.7	31.9	31.9	32.6	32.7
161	33.5	33.8	33.1	33.2	33.0	30.6	31.7	32.0	32.6	32.6
162	33.5	33.7	32.6	33.0	33.2	30.5	31.7	32.0	32.6	32.5
163	33.6	33.7	32.6	32.9	32.8	30.5	31.8	32.1	32.4	32.5
164	33.6	33.7	32.7	33.0	32.2	30.4	31.9	32.0	32.4	32.4
165	33.6	33.8	32.7	33.1	32.3	30.4	31.9	32.0	32.4	32.5
166	33.5	33.9	32.7	33.2	32.5	30.5	32.0	31.9	32.4	32.5
167	33.4	33.9	32.8	33.2	32.6	30.6	31.8	31.9	32.4	32.5
168	33.4	33.9	32.9	33.3	32.6	30.6	31.7	31.9	32.5	32.5
169	33.4	33.8	32.7	33.1	32.6	30.6	31.7	32.1	32.6	32.5
170	33.4	33.8	33.6	33.0	32.6	30.6	31.6	32.3	32.6	32.6
171	33.6	33.8	32.5	32.8	32.5	30.6	31.6	32.3	32.6	32.5
172	33.6	33.6	32.6	32.9	32.5	30.5	31.7	32.2	32.6	32.5
173	33.7	33.7	32.6	33.0	32.5	30.5	31.7	32.1	32.5	32.5
174	33.6	33.9	32.7	33.2	32.6	30.5	31.7	31.9	32.7	32.5
175	33.5	34.0	32.8		32.7	30.7	31.7	31.8	32.6	32.5
176	33.4	34.0	32.9		32.8	30.8	31.7	31.7		32.5
177	33.3	34.0	32.9		32.8	29.9	31.6	31.8		32.3
178	33.4	34.0	32.8		32.8		31.6	32.0		32.8
179	35.2	34.0	32.8		32.8		31.6	32.2		33.1

Missing data (blanks) are due to equipment malfuntion.

Table AII-4 (cont.)

SST Condition
Face Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
0	34.1	34.8	34.6	32.9	35.0	33.1	33.3	34.7		34.1
1	34.0	33.9	34.1	32.3	34.2	33.2	33.9			33.7
2	33.2	33.2	33.0	31.9	33.2	33.0	32.6			32.9
3	32.4	32.6	32.3	31.7	32.5	32.1	31.5			32.2
4	31.8	32.1	31.8	31.2	31.6	31.2	31.8			31.6
5	31.1	31.7	31.0	30.6	31.3	30.5	31.9	31.8		31.2
6	30.6	31.4	30.2	30.2	30.6	29.7	31.3			30.6
7	30.1	31.1	29.6	30.0	29.7	28.9	30.7			30.0
8	29.7	30.4	29.2	29.7	29.0	28.2	30.1			29.5
9	29.1	29.6	28.9	29.4	28.1	27.8	29.5			28.9
10	28.6	29.2	28.8	29.0	27.9	27.2	29.2	27.0		28.4
11	28.2	28.8	28.5	29.2	27.7	26.9	28.7			28.3
12	27.8	28.6	28.2	29.1	27.6	26.7	28.1			28.0
13	27.4	28.3	27.9	28.7	27.4	26.0	27.7			27.6
14	27.4	28.0	27.6	28.6	27.1	25.7	27.4			27.4
15	26.7	27.7	27.1	28.2	26.9	25.4	26.8	26.2		26.9
16	26.2	27.4	26.6	28.0	26.6	25.2	26.4			26.6
17	25.8	27.0	26.5	27.8	26.3	24.9	26.2			26.4
18	25.4	26.9	26.7	27.6	26.1	24.6	25.9			26.2
19	25.1	26.8	26.6	27.4	26.0	24.2	25.4			25.9
20	24.9	26.6	26.3	27.3	25.8	23.9	25.1	25.1		25.6
21	24.7	26.5	26.1	27.2	25.6	23.7	24.8			25.5
22	24.5	26.4	26.0	27.0	25.4	23.5	24.5			25.3
23	24.3	26.2	25.8	27.1	25.2	23.3	24.2			25.2
24	24.1	26.0	25.7	27.0	25.0	23.1	23.9			25.0
25	23.9	25.8	25.4	26.9	24.9	22.9	23.7	23.8		24.7
26	23.7	25.7	24.7	26.8	24.8	22.7	23.7			24.6
27	23.5	25.6	24.3	26.6	24.8	22.5	23.6			24.4
28	23.3	25.5	24.0	26.5	24.7	22.3	23.5			24.3
29	23.1	25.3	23.6	26.4	24.7	22.1	23.3			24.1
30	22.8	25.2	23.4	26.2	24.6	22.1	23.2	22.8		23.8
31	22.6	25.2	23.1	26.1	24.4	22.0	22.9			23.8
32	22.4	25.1	23.2	26.1	24.4	22.1	22.8			23.7
33	22.1	25.1	23.4	26.2	24.3	22.3	22.7			23.7
34	22.0	25.1	23.3	26.3	24.2	22.4	22.6			23.7
35	21.9	25.0	23.7	26.3	24.1	22.6	22.4	23.3		23.7
36	21.8	25.1	24.6	26.3	23.8	22.4	22.2			23.7
37	21.7	25.0	24.8	26.4	23.5	22.4	22.4			23.7
38	21.6	24.8	24.8	26.3	23.1	22.6	22.3			23.6
39	21.5	24.7	25.0	26.4	22.8	22.5	22.2			23.6
40	21.6	24.4	24.9	26.3	22.9	22.4	22.0	22.3		23.4
41	21.7	24.5	24.8	25.9	23.0	22.2	21.8			23.4
42	21.8	24.6	24.8	26.1	23.2	22.0	21.1			23.4
43	21.8	24.6	24.0	25.8	23.3	21.9	21.6			23.3
44	21.8	24.6	23.2	25.6	23.2	22.0	21.4			23.1
45	21.8	24.6	23.0	25.6	23.1	22.0	21.6	21.1		22.9

Missing data (blanks) are due to equipment malfuntion.

Table AII-4 (cont.)

SST Condition
Face Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
46	21.7	24.6	23.2	25.6	23.1	22.2	21.6			23.1
47	21.6	24.5	23.5	25.6	23.0	22.3	21.7			23.2
48	21.6	24.6	23.6	25.4	23.0	22.3	21.6			23.2
49	21.7	24.5	23.8	25.5	22.9	22.2	21.4			23.1
50	21.4	24.3	24.1	25.4	23.0	22.0	21.4	22.0		23.0
51	21.2	24.3	23.8	25.2	22.9	22.0	21.2			22.9
52	21.1	24.1	23.7	25.3	22.9	21.8	21.2			22.9
53	21.0	24.1	23.7	25.4	22.9	21.6	21.1			22.8
54	20.9	24.1	23.6	25.5	22.8	21.5	21.0			22.8
55	21.0	24.0	23.7	25.5	22.6	21.4	21.0	21.9		22.6
56	21.0	24.1	23.5	25.5	22.8	21.2	21.0			22.7
57	21.1	24.1	23.4	25.5	22.7	21.0	21.0			22.7
58	21.1	24.0	23.3	25.4	22.5	20.8	21.0			22.6
59	21.1	24.1	23.4	25.4	22.3	20.8	20.9			22.6
60	21.1	24.0	23.3	25.4	22.2	20.9	20.8	20.7		22.3
61	21.1	23.9	23.5	25.5	22.2	20.8	20.7			22.5
62	21.0	23.9	23.6	25.7	22.2	20.8	20.5			22.5
63	21.0	23.9	23.8	25.5	22.2	20.8	20.4			22.5
64	20.9	24.1	24.0	25.4	22.3	20.6	20.4			22.5
65	20.8	24.1	24.1	25.4	22.3	20.5	20.4	22.2		22.5
66	20.8	24.2	24.3	25.5	22.3	20.7	20.4			22.6
67	20.7	24.1	24.3	25.5	22.3	20.8	20.4			22.6
68	20.8	23.9	24.2	25.6	22.2	20.8	20.4			22.6
69	20.9	23.8	24.5	25.8	22.3	20.8	20.3			22.6
70	21.0	23.9	24.7	25.5	22.4	20.7	20.1	21.5		22.5
71	21.0	24.1	25.0	25.4	22.4	20.6	20.1			22.7
72	20.9	24.2	24.6	25.2	22.2	20.4	20.2			22.5
73	21.0	24.3	24.7	25.1	21.9	20.2	20.2			22.5
74	20.9	24.4	24.1	25.1	21.8	20.0	20.3			22.4
75	20.9	24.3	24.0	25.0	21.8	19.9	20.4	20.6		22.1
76	20.8	24.2	24.3	24.8	21.9	19.9	20.3			22.3
77	20.7	24.1	24.2	24.7	21.9	20.0	20.3			22.3
78	20.7	24.0	24.3	24.7	21.8	20.1	20.4			22.3
79	20.7	23.9	24.0	24.6	21.8	20.1	20.3			22.2
80	20.8	23.8	23.8	24.7	21.9	20.1	20.4	21.2		22.1
81	20.9	23.7	23.7	24.8	22.0	20.1	20.4			22.2
82	20.8	23.6	23.5	25.0	22.1	20.0	20.5			22.2
83	20.8	23.6	23.7	25.0	22.1	19.9	20.5			22.2
84	20.7	23.7	23.7	25.0	22.1	19.9	20.6			22.2
85	20.7	23.8	23.7	24.9	22.1	19.8	20.6	20.5		22.0
86	20.8	23.7	23.8	24.9	22.0	19.7	20.5			22.2
87	20.7	23.6	23.9	25.0	21.9	19.7	20.4			22.2
88	20.7	23.5	24.1	24.9	21.9	19.6	20.3			22.1
89	20.7	23.4	24.0	25.0	21.9	19.6	20.3			22.1
90	20.7	23.3	23.9	25.2	21.8	19.5	20.2	21.2		22.0
91	20.7	23.1	23.8	25.3	21.8	19.6	20.3			22.1

Missing data (blanks) are due to equipment malfuntion.

Table AII-4 (cont.)

SST Condition
Face Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
92	20.6	22.9	23.6	25.4	21.8	19.6	20.5			22.1
93	20.5	22.8	23.6	25.5	21.8	19.7	20.6			22.1
94	20.4	22.9	23.4	25.5	21.8	20.0	20.7			22.1
95	20.4	22.9	23.4	25.4	22.0	20.2	20.7	20.9		22.0
96	20.5	23.1	23.6	25.9	21.9	20.4	20.6			22.3
97	20.5	23.1	23.8	25.7	22.0	20.2	20.6			22.3
98	20.5	23.1	23.8	25.4	22.0	20.1	20.6			22.2
99	20.5	23.2	23.9	25.0	21.9	19.9	20.5			22.1
100	20.5	23.2	24.7	25.0	21.7	19.8	20.4	20.5		22.0
101	20.5	23.2	24.9	25.0	21.6	19.6	20.5			22.2
102	20.6	23.4	24.9	24.8	21.4	19.5	20.6			22.2
103	20.6	23.5	24.9	24.8	21.3	19.5	20.5			22.2
104	20.6	23.6	24.4	24.7	21.4	19.4	20.4			22.1
105	20.5	23.7	24.1	24.7	21.3	19.3	20.4	20.2		21.8
106	20.5	23.7	24.0	24.6	21.3	19.4	20.3			22.0
107	20.2	23.7	24.2	24.7	21.4	19.5	20.3			22.0
108	20.1	23.7	23.9	24.9	21.5	19.6	20.3			22.0
109	19.7	23.7	23.4	25.1	21.6	19.7	20.4			21.9
110	20.1	23.6	23.6	25.3	21.6	19.8	20.4	20.4		21.9
111	20.6	23.6	23.8	25.4	21.6	19.8	20.4			22.2
112	20.7	23.5	23.8	25.3	21.6	19.8	20.4			22.2
113	20.4	23.3	23.7	25.1	21.6	19.7	20.3			22.0
114	20.3	23.3	23.5	25.1	21.5	19.6	20.3			21.9
115	20.3	23.3	23.5	25.1	21.4	19.7	20.1	20.3		21.7
116	20.2	23.3	23.8	25.0	21.4	19.4	20.1			21.9
117	20.1	23.2	23.7	25.0	21.3	19.2	20.0			21.8
118	20.0	23.2	23.7	25.2	21.2	19.1	19.9			21.8
119	20.0	23.2	23.9	25.2	21.1	19.2	19.9			21.8
120	20.0	23.1	24.2	25.1	21.0	19.3	20.0	20.9		21.7
121	20.2	23.1	24.3	25.2	21.1	19.5	20.2			21.9
122	20.2	23.0	24.2	25.5	21.3	19.5	20.4			22.0
123	20.2	23.2	24.3	25.5	21.4	19.6	20.6			22.1
124	20.2	23.2	24.0	25.5	21.5	19.8	20.7			22.1
125	20.3	23.3	24.3	25.4	21.6	19.9	20.8	20.7		22.0
126	20.5	23.4	25.1	25.3	21.6	20.0	21.0			22.4
127	20.6	23.5	24.9	25.8	21.6	19.7	21.2			22.5
128	20.7	23.4	24.6	25.5	21.5	19.7	21.2			22.4
129	20.7	23.3	24.7	25.2	21.4	19.7	21.1			22.3
130	20.7	23.3	24.5	24.9	21.1	19.5	21.1	21.1		22.0
131	20.7	23.2	24.5	24.8	20.9	19.4	21.1			22.1
132	20.7	23.2	24.0	24.8	21.0	19.1	21.1			22.0
133	20.7	23.6	24.3	24.8	21.2	19.1	21.0			22.1
134	20.7	23.9	24.2	24.7	21.3	19.3	20.9			22.1
135	20.6	23.8	24.0	24.7	21.4	19.4	20.8	20.5		21.9
136	20.5	23.8	24.0	24.9	21.5	19.4	20.8			22.1
137	20.4	23.9	23.9	25.0	21.6	19.5	20.7			22.1

Missing data (blanks) are due to equipment malfuntion.

Table AII-4 (cont.)

SST Condition
Face Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
138	20.3	24.0	24.4	25.1	21.5	19.4	20.7			22.2
139	20.3	23.8	24.4	25.1	21.4	19.4	20.8			22.2
140	20.5	23.7	24.2	25.1	21.4	19.2	20.8	20.5		21.9
141	20.6	23.6	24.1	24.9	21.4	19.1	20.6			22.0
142	20.6	23.5	24.1	24.9	21.3	18.9	20.6			22.0
143	20.6	23.6	23.9	24.9	21.2	18.9	20.5			21.9
144	20.5	23.5	23.6	24.9	21.1	19.0	20.5			21.9
145	20.6	23.4	23.7	24.8	21.0	19.0	20.4	20.1		21.6
146	20.4	23.4	23.8	24.7	21.0	19.2	20.3			21.8
147	20.2	23.4	23.9	24.8	21.1	19.3	20.3			21.9
148	20.1	23.4	24.0	24.8	21.1	19.2	20.2			21.8
149	20.1	23.4	24.1	24.8	21.0	19.2	20.1			21.8
150	20.0	23.3	24.8	25.0	21.1	19.2	19.9	21.1		21.8
151	20.1	23.3	24.9	25.4	21.3	19.2	20.0			22.0
152	20.2	23.4	24.5	25.7	21.3	19.2	20.1			22.1
153	20.2	23.5	24.3	25.7	21.4	19.5	20.2			22.1
154	20.3	23.6	23.9	25.7	21.3	19.6	20.2			22.1
155	20.3	23.7	23.8	25.6	21.2	19.7	20.2	20.4		21.9
156	20.4	23.7	24.3	25.4	21.1	19.5	20.2			22.1
157	20.5	23.8	24.1	25.9	21.0	19.5	20.2			22.1
158	20.5	23.7	24.2	25.6	20.8	19.5	20.1			22.1
159	20.5	23.6	24.3	25.6	20.5	19.4	20.0			22.0
160	20.5	23.4	24.0	25.2	20.4	19.4	19.9	20.4		21.7
161	20.4	23.5	23.6	25.0	20.7	19.2	20.0			21.8
162	20.5	23.7	23.4	24.9	20.9	19.2	19.9			21.8
163	20.5	23.7	23.4	24.8	21.0	19.2	19.9			21.8
164	20.3	23.8	23.0	24.7	21.0	19.3	19.8			21.7
165	20.2	23.9	23.1	24.8	21.1	19.3	19.7	20.2		21.5
166	20.1	23.9	23.3	25.1	21.1	19.5	19.7			21.8
167	20.0	23.9	24.0	25.1	21.1	19.6	19.8			21.9
168	20.1	23.9	24.0	25.2	21.0	19.6	19.8			21.9
169	20.1	23.7	23.8	25.4	20.9	19.5	19.8			21.9
170	20.0	23.6	23.8	25.4	20.9	19.4	19.8	20.8		21.7
171	20.0	23.5	24.1	25.2	20.8	19.3	19.8			21.8
172	19.9	23.5	23.7	25.2	20.8	19.1	19.8			21.7
173	19.9	23.5	23.5		20.9	19.1	19.8			21.1
174	19.8	23.5	23.4		21.0	19.0	19.7			21.1
175	19.8	23.5	23.1	25.2	21.0	18.9	19.6	21.1		21.5
176	34.8	23.4	23.1		21.0	18.9	19.5			23.5
177	33.9	23.4	23.0		21.0	19.2	19.5			23.3
178	33.2	23.4	23.0		21.1	19.5	19.5			23.3
179	32.6				21.1	19.6	19.5			23.2

Missing data (blanks) are due to equipment malfuntion.

Table AII-5

Warm Condition
Toe Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
0	32.1	32.0	24.7	23.3	26.0		30.0	29.7	25.8	28.0
1	32.0	32.2	24.7	23.3	26.0		29.9	29.6	25.9	28.0
2	31.4	32.0	24.7	23.4	26.0		29.9	29.4	26.0	27.9
3	31.0	32.2	24.7	23.4	26.0		29.8	29.4	26.0	27.8
4	30.7	32.2	24.6	23.4	26.0		29.7	29.5	26.0	27.8
5	30.4	32.2	24.6	23.4	25.9		28.6	29.7	26.0	27.6
6	30.3	32.3	24.6	23.4	25.8		29.1	28.5	25.9	27.5
7	30.4	32.4	24.6	23.3	25.8		29.9	28.6	25.9	27.6
8	30.2	32.5	24.7	23.3	25.9		29.8	28.5	25.9	27.6
9	30.0	32.6	24.7	23.4	25.9		29.7	28.5	25.9	27.6
10	29.9	32.5	24.8	23.7	25.9		29.7	28.5	25.9	27.6
11	29.9	32.3	24.8	23.9	25.8		29.7	28.5	25.9	27.6
12	29.5	32.2	24.9	23.9	25.9		27.7	28.4	25.9	27.3
13	29.3	32.2	25.0	23.8	25.8		28.2	28.2	26.0	27.3
14	29.3	32.1	25.1	23.7	25.8		29.5	28.2	26.1	27.5
15	29.8	32.1	25.1	23.7	25.7		29.4	28.2	26.2	27.5
16	29.7	32.0	25.2	23.7	25.8		29.6	28.2	26.1	27.5
17	29.5	32.2	25.6	23.7	25.8		29.6	28.2	26.1	27.6
18	29.4	32.3	25.8	23.7	25.9		29.7	28.2	26.1	27.6
19	29.2	32.3	25.8	23.7	25.8		29.7	28.1	26.1	27.6
20	29.1	32.2	25.8	23.7	25.7		29.6	28.1	26.2	27.6
21	29.5	32.2	25.7	23.6	25.8		29.1	28.1	26.8	27.6
22	30.1	32.3	25.7	23.8	25.8		29.1	28.0	27.2	27.8
23	30.4	32.2	25.7	23.9	25.8		29.3	28.0	27.3	27.8
24	30.3	32.1	25.8	24.0	25.8		29.3	28.2	27.4	27.9
25	30.0	32.1	25.8	24.0	25.8		29.1	28.6	27.4	27.9
26	29.8	32.1	25.8	24.4	25.8		29.1	28.9	27.4	27.9
27	29.6	32.0	25.7	25.1	25.8		29.3	29.0	27.4	28.0
28	29.6	32.0	25.7	26.0	25.8		29.3	29.1	27.3	28.1
29	29.3	31.9	25.6	26.5	25.8		29.1	29.4	27.[illegible]	28.1
30	29.1	32.0	25.6	26.5	25.9		29.1	29.5	27.1	28.1
31	28.8	32.0	25.6	26.3	25.9		29.0	29.6	27.1	28.0
32	28.7	32.0	25.8	26.2	25.9		29.1	29.8	27.1	28.1
33	28.7	32.0	26.0	26.2	25.7		29.2	29.9	27.1	28.1
34	28.7	32.0	26.0	26.4	25.8		29.2	29.8	27.2	28.1
35	28.6	32.0	26.0	27.1	25.8		28.7	29.9	27.3	28.2
36	29.0	31.9	25.9	27.5	25.7		29.0	30.5	27.4	28.4
37	28.8	31.8	26.0	27.6	25.7		29.0	30.8	27.3	28.4
38	28.7	31.7	26.0	27.6	25.7		29.1	30.9	27.1	28.4
39	28.4	31.6	26.0	24.2	25.7		29.0	30.8	27.0	27.8
40	28.5	31.6	26.0	27.2	25.8		28.9	30.7	27.0	28.2
41	28.5	31.7	25.9	27.1	25.7		28.8	30.6	26.9	28.2
42	28.2	31.7	25.8	26.9	25.7		28.6	30.7	26.9	28.1
43	28.1	31.7	25.6	26.8	25.6		28.5	30.5	26.9	28.0
44	28.0	31.6	25.5	26.7	25.8		28.5	30.4	26.9	27.9
45	28.0	31.6	25.5	26.5	25.8		28.6	30.0	26.9	27.9

Missing data (blanks) are due to equipment malfuntion.

Table AII-5 (cont.)

Warm Condition
Toe Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
46	28.3	31.5	25.5	26.4	25.5		28.7	30.1	26.9	27.9
47	28.6	31.4	25.4	26.3	25.5		28.8	30.1	26.9	27.9
48	28.5	31.3	25.5	26.4	25.5		28.7	30.1	27.3	27.9
49	28.2	31.3	25.5	26.6	25.5		28.5	30.1	27.7	27.9
50	28.1	31.4	25.5	26.6	25.4		28.4	30.1	27.9	27.9
51	28.0	31.3	25.6	26.6	25.4		28.4	30.3	27.9	27.9
52	27.9	31.3	25.5	26.5	25.4		28.2	30.3	27.9	27.9
53	27.9	31.3	25.6	26.5	25.4		28.3	30.2	27.9	27.9
54	27.7	31.2	25.6	26.7	25.5		28.6	30.4	27.8	27.9
55	27.7	31.1	25.6	26.6	25.4		28.3	30.3	27.6	27.8
56	27.6	31.2	25.7	26.5	25.4		28.0	30.1	27.6	27.8
57	27.6	31.7	25.6	26.5	25.3		28.2	30.0	27.7	27.8
58	27.5	31.9	25.6	26.4	25.3		28.5	30.0	28.0	27.9
59	27.3	31.7	25.6	26.3	25.4		27.5	30.1	27.8	27.7
60	27.3	31.7	25.6	26.2	25.6		28.1	30.3	23.3	27.3
61	27.2	31.6	25.6	26.0	25.7		28.1	30.2	27.7	27.8
62	27.2	31.5	25.5	25.9	25.7		27.9	30.3	28.0	27.8
63	27.2	31.3	25.4	25.7	25.8		28.1	30.1	28.0	27.7
64	27.1	31.2	25.3	25.7	25.7		28.1	30.0	28.0	27.6
65	26.9	31.0	25.3	25.6	25.8		28.1	29.9	28.0	27.6
66	26.8	30.9	25.3	25.6	25.6		28.0	29.9	27.9	27.5
67	26.9	30.9	25.2	25.5	25.6		28.1	29.8	27.8	27.5
68	27.2	30.8	25.2	25.4	25.7		28.0	29.8	27.7	27.5
69	27.1	30.7	25.1	25.3	25.8		28.0	29.9	27.6	27.4
70	27.1	30.6	25.1	25.2	25.7		28.0	29.9	27.6	27.4
71	26.8	30.5	25.0	25.2	25.8		28.0	29.9	27.6	27.4
72	26.7	30.6	24.9	25.1	25.8		28.1	29.8	27.6	27.3
73	26.9	30.5	24.9	25.1	25.7		28.0	29.8	27.5	27.3
74	27.1	30.4	24.9	25.1	25.7		28.1	29.8	27.5	27.3
75	27.1	30.3	24.9	25.0	25.6		27.9	29.7	27.5	27.3
76	26.9	30.1	24.9	25.0	25.6		27.8	29.7	27.4	27.2
77	26.9	30.1	24.9	24.9	25.7		27.8	29.8	27.5	27.2
78	27.0	30.1	24.9	24.9	25.7		26.6	29.7	27.4	27.0
79	27.1	30.0	24.9	24.8	25.8		27.6	29.6	27.4	27.2
80	27.1	30.0	24.8	24.8	25.8		27.6	29.6	27.7	27.2
81	27.0	30.1	25.0	24.8	25.7		27.7	29.5	28.0	27.2
82	26.8	30.1	25.0	24.8	25.6		27.5	29.5	28.1	27.2
83	26.7	30.0	24.9	24.8	25.7		27.6	29.6	28.1	27.2
84	26.7	30.0	24.9	24.7	25.6		27.6	29.6	28.1	27.2
85	26.5	30.0	24.9	24.6	25.3		27.5	29.6	28.0	27.1
86	26.3	30.0	24.8	24.5	25.2		27.3	29.7	28.0	27.0
87	26.4	29.9	24.8	24.5	25.3		27.4	29.6	28.0	27.0
88	26.3	30.0	24.8	24.4	25.4		27.3	29.5	28.0	27.0
89	26.3	29.9	24.7	24.4	25.5		27.4	29.5	28.0	27.0
90	26.3	29.8	24.7	24.3	25.5		27.1	29.4	28.0	26.9
91	26.2	29.7	24.7	24.3	25.5		27.3	29.6	28.0	26.9

Missing data (blanks) are due to equipment malfuntion.

Table AII-5 (cont.)

Warm Condition
Toe Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
92	26.2	29.6	24.7	24.3	25.5		26.9	29.6	28.0	26.9
93	26.1	29.5	24.8	24.2	25.4		27.7	29.7	27.9	26.9
94	26.1	29.4	24.8	24.1	25.3		27.0	29.7	27.8	26.8
95	26.0	29.3	24.7	24.0	25.1		27.1	29.6	27.7	26.7
96	26.2	29.3	24.6	24.0	25.2		27.5	29.6	27.7	26.8
97	26.2	29.2	24.5	23.9	25.3		27.6	29.7	27.7	26.8
98	26.1	29.1	24.5	23.9	25.4		27.6	29.7	27.7	26.8
99	26.0	29.1	24.4	23.9	25.3		27.5	29.7	27.7	26.7
100	25.8	29.0	24.4	23.9	25.3		27.4	29.7	27.7	26.7
101	25.9	29.2	24.4	23.9	25.2		27.4	29.7	27.7	26.7
102	26.0	29.0	24.4	23.8	25.1		27.3	29.8	27.6	26.6
103	26.0	28.8	24.4	23.8	25.1		27.0	29.7	27.6	26.6
104	26.0	29.0	24.4	23.7	25.1		27.0	29.7	27.6	26.6
105	26.0	29.1	24.4	23.7	25.2		27.0	29.6	27.8	26.6
106	25.9	29.0	24.4	23.7	25.1		27.0	29.7	28.4	26.7
107	25.9	29.1	24.4	23.7	24.9		26.8	29.7	28.5	26.6
108	25.8	29.1	24.5	23.7	24.9		26.8	29.6	28.5	26.6
109	25.7	29.0	24.6	23.7	24.7		26.6	29.6	28.6	26.6
110	25.5	29.0	24.6	23.6	24.6		26.7	29.5	28.7	26.5
111	25.5	28.9	24.6	23.5	24.6		26.7	29.6	28.7	26.5
112	25.3	28.8	24.7	23.5	24.6		26.9	29.7	28.6	26.5
113	25.3	28.8	24.6	23.4	24.7		26.9	29.7	28.5	26.5
114	25.4	28.7	24.6	23.4	24.8		26.9	29.7	28.5	26.5
115	25.3	28.6	24.5	23.4	24.8		27.0	29.6	28.4	26.5
116	25.3	28.5	24.4	23.4	24.8		27.2	29.5	28.3	26.4
117	25.1	28.4	24.5	23.4	24.9		26.8	29.5	28.3	26.4
118	25.1	28.3	24.4	23.4	24.9		26.8	29.4	28.5	26.4
119	25.2	28.3	24.3	23.4	24.8		26.7	29.4	28.5	26.3
120	25.1	28.4	24.3	23.4	24.7		26.7	29.5	28.6	26.3
121	25.2	28.3	24.3	23.3	24.7		26.8	29.5	28.2	26.3
122	25.1	28.2	24.3	23.2	24.8		26.7	29.7	28.1	26.3
123	25.2	28.2	24.3	23.2	24.8		26.4	29.8	28.0	26.2
124	25.2	28.0	24.3	23.1	24.9		26.5	29.8	28.0	26.2
125	25.3	28.0	24.2	23.1	24.9		26.3	29.8	28.0	26.2
126	25.3	28.0	24.0	23.1	24.7		26.5	29.7	28.0	26.2
127	25.4	28.0	24.0	23.1	24.6		26.4	29.6	28.0	26.1
128	25.3	28.0	24.1	23.1	24.6		26.2	29.5	28.0	26.1
129	25.1	28.0	24.1	23.0	24.7		22.6	29.7	28.0	25.7
130	25.1	28.0	24.1	23.0	24.7		22.7	29.6	27.9	25.6
131	25.2	28.0	24.1	23.0	24.7		23.5	29.5	27.8	25.7
132	25.2	28.0	24.1	23.0	24.7		23.0	29.2	27.8	25.6
133	25.4	28.0	24.1	23.0	24.8		23.1	29.2	27.8	25.7
134	25.3	28.0	24.1	23.0	24.8		24.2	29.3	27.7	25.8
135	25.2	28.0	24.2	23.0	24.7		26.3	29.5	28.0	26.1
136	25.2	28.0	24.2	22.9	24.7		26.1	29.6	28.5	26.2
137	25.0	27.9	24.2	22.9	24.5		25.9	29.5	28.7	26.1

Missing data (blanks) are due to equipment malfuntion.

Table AII-5 (cont.)

Warm Condition
Toe Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
138	24.9	27.8	24.2	22.8	24.4		23.4	29.5	28.6	25.7
139	25.1	27.7	24.3	22.8	24.4		22.7	29.6	28.6	25.7
140	25.0	27.6	24.4	22.8	24.6		23.8	29.6	28.4	25.8
141	24.8	27.6	24.5	22.8	24.7		25.6	29.7	28.3	26.0
142	24.9	27.6	24.4	22.8	24.7		23.3	29.6	28.4	25.7
143	24.9	27.4	24.4	22.7	24.5		21.8	29.4	28.2	25.4
144	25.0	27.4	24.4	22.7	24.4		23.0	29.2	28.1	25.5
145	24.8	27.3	24.3	22.7	24.4		25.8	29.0	28.2	25.8
146	24.9	27.4	24.3	22.6	24.3		25.7	29.1	28.1	25.8
147	24.8	27.4	24.3	22.6	24.2		25.9	29.2	28.1	25.8
148	24.7	27.3	24.3	22.6	24.2		26.0	29.1	28.1	25.8
149	24.7	27.2	24.2	22.5	24.4		25.9	29.1	28.1	25.8
150	24.8	27.1	24.2	22.5	24.5		26.0	29.3	27.9	25.8
151	24.9	27.1	24.2	22.6	24.6		26.0	29.5	27.9	25.9
152	24.8	27.1	24.1	22.5	24.7		25.8	29.5	27.8	25.8
153	24.7	27.1	24.0	22.5	24.6		24.8	29.4	27.8	25.6
154	24.6	27.0	24.0	22.5	24.5		21.9	29.4	27.8	25.2
155	24.8	26.9	24.1	22.5	24.3		22.1	29.3	27.7	25.2
156	25.0	26.9	24.0	22.5	24.2		22.2	29.2	27.6	25.2
157	24.9	26.8	24.0	22.5	24.2		22.2	29.2	27.6	25.2
158	25.0	26.8	24.0	22.5	24.3		22.1	29.2	27.6	25.2
159	24.8	26.8	23.9	22.5	24.4		22.0	29.2	27.5	25.1
160	24.8	26.8	23.9	22.5	24.5		22.0	29.1	27.5	25.1
161	25.0	26.8	23.9	22.4	24.4		24.4	29.0	28.0	25.5
162	24.9	26.7	23.9	22.4	24.4		22.1	28.9	28.0	25.2
163	24.6	26.7	24.0	22.3	24.4		23.0	29.1	28.1	25.3
164	25.0	26.7	24.1	22.3	24.4		24.7	29.1	28.0	25.5
165	24.9	26.7	24.1	22.3	24.4		25.6	29.1	28.0	25.6
166	24.9	26.7	24.2	22.3	24.4		24.0	29.2	28.0	25.5
167	24.7	26.7	24.2	22.3	24.4		24.9	29.1	28.0	25.5
168	24.7	26.7	24.0	22.2	24.5		25.3	29.2	28.0	25.6
169	24.8	26.7	24.0	22.2	24.6		25.6	29.0	28.0	25.6
170	24.8	26.6	24.0	22.2	24.3		25.7	29.2	28.0	25.6
171	24.6	26.6	24.0	22.1	24.2		25.6	29.4	28.0	25.6
172	24.6	26.5	24.0	22.1	24.1		25.8	29.4	27.9	25.6
173	24.6	26.3	24.2	22.1	24.2		25.7	29.1	28.0	25.5
174	24.5	26.4	24.4	22.1	24.2		25.4	29.0	28.0	25.5
175	24.6	26.4	24.5		24.3		25.5	29.2	28.0	26.1
176	24.6	26.4	24.4		24.3		25.6	29.2		25.8
177	24.4	26.3	24.6		24.3		24.3	29.0		25.5
178	24.6	26.3	24.7		24.3		25.6	28.9		25.7
179	32.0	26.2	25.1		24.3		25.7	29.1		27.1

Missing data (blanks) are due to equipment malfuntion.

Table AII-5 (cont.)

Cold Condition
Toe Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
0	26.7	23.0	26.4	26.1	25.6		26.9	34.9	23.4	26.6
1	26.7	23.2	26.4	26.1	25.8		26.9	34.8	0.0	23.7
2	26.8	23.3	26.2	26.0	25.9		26.9	34.7	0.0	23.7
3	26.7	23.3	26.1	25.9	26.0		26.8	34.5	0.0	23.7
4	26.7	23.3	26.0	25.8	26.6		26.6	34.3	0.0	23.7
5	26.4	23.2	25.8	25.5	27.1		26.5	34.0	22.9	26.4
6	26.2	23.2	25.7	25.2	25.7		26.3	33.6	0.0	23.2
7	26.1	23.0	25.5	24.9	25.2		26.1	33.3	0.0	23.0
8	25.9	22.7	25.2	24.7	24.8		25.8	33.1	0.0	22.8
9	25.7	22.6	25.0	24.4	24.3		25.6	32.8	0.0	22.6
10	25.5	22.4	24.8	24.2	23.9		25.3	32.2	21.7	25.0
11	25.3	22.2	24.5	24.0	23.5		24.9	31.7	0.0	22.0
12	25.1	22.0	24.3	23.7	23.0		24.5	31.3	0.0	21.7
13	24.9	21.8	24.1	23.5	22.6		24.1	30.9	0.0	21.5
14	24.7	21.6	23.8	23.2	22.2		23.7	30.5	0.0	21.2
15	24.4	21.4	23.5	23.0	21.8		23.3	30.1	20.8	23.5
16	24.2	21.1	23.2	22.8	21.3		23.0	29.6	0.0	20.7
17	23.9	20.9	22.9	22.5	21.0		22.6	29.1	0.0	20.4
18	23.6	20.6	22.9	22.2	20.6		22.2	28.8	0.0	20.1
19	23.4	20.4	22.7	21.9	20.2		21.8	28.3	0.0	19.8
20	23.1	20.1	22.5	21.6	19.8		21.5	27.9	19.9	22.1
21	22.9	20.0	22.3	21.4	19.4		21.2	27.4	0.0	19.3
22	22.7	19.9	22.0	21.1	19.0		20.8	27.0	0.0	19.1
23	22.4	19.7	21.8	20.9	18.4		20.4	26.4	0.0	18.8
24	22.1	19.5	21.6	20.9	18.1		20.1	25.9	0.0	18.5
25	21.8	19.2	21.3	20.6	17.6		19.7	25.5	18.9	20.6
26	21.6	18.9	21.1	20.4	17.3		19.4	25.1	0.0	18.0
27	21.3	18.7	20.9	20.2	17.0		19.1	24.6	0.0	17.7
28	21.0	18.4	20.6	19.9	16.6		18.8	24.1	0.0	17.4
29	20.7	18.2	20.4	19.7	16.2		18.5	23.7	0.0	17.2
30	20.5	17.9	20.0	19.5	15.8		18.2	23.3	17.4	19.1
31	20.2	17.6	19.7	19.2	15.4		17.8	23.0	0.0	16.6
32	20.1	17.2	19.5	19.0	15.3		17.5	22.9	0.0	16.4
33	20.1	16.9	19.4	18.8	15.3		17.3	22.7	0.0	16.3
34	20.0	16.6	19.1	18.6	15.9		17.0	22.4	0.0	16.2
35	20.1	16.4	18.9	18.3	15.5		16.7	21.8	16.7	18.1
36	19.3	16.2	18.5	17.7	14.6		16.4	21.3	0.0	15.5
37	18.8	15.8	18.2	17.3	14.4		16.1	21.0	0.0	15.2
38	18.6	15.6	17.9	17.0	14.0		15.8	20.7	0.0	15.0
39	18.3	15.3	17.7	17.0	13.7		15.6	20.3	0.0	14.7
40	18.1	15.0	17.4	16.7	13.4		15.3	19.9	15.7	16.4
41	17.8	14.8	17.1	16.9	13.1		15.0	19.5	0.0	14.3
42	17.6	14.6	16.9	16.4	12.8		14.7	19.2	0.0	14.0
43	17.3	14.3	16.7	15.9	12.6		14.5	18.9	0.0	13.8
44	17.1	14.2	16.5	15.6	12.4		14.2	18.5	0.0	13.6
45	17.0	14.0	16.3	15.4	12.1		14.0	18.2	15.0	15.3

Missing data (blanks) are due to equipment malfuntion.

Table AII-5 (cont.)

Cold Condition
Toe Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
46	16.7	13.7	16.0	15.1	11.9		13.8	18.0	0.0	13.2
47	16.5	13.5	15.8	14.6	11.7		13.6	17.7	0.0	12.9
48	16.3	13.3	15.6	14.4	11.4		13.4	17.3	0.0	12.7
49	16.2	13.0	15.6	14.3	11.1		13.2	17.0	0.0	12.6
50	16.0	12.8	15.5	14.1	10.9		12.9	16.8	14.5	14.2
51	15.8	12.6	15.4	14.0	10.7		12.7	16.5	0.0	12.2
52	15.5	12.4	15.2	13.6	10.4		12.7	16.2	0.0	12.0
53	15.3	12.2	15.1	13.4	10.0		12.8	16.0	0.0	11.9
54	15.1	12.1	14.9	13.1	9.9		12.9	15.7	0.0	11.7
55	14.9	12.0	14.8	13.0	9.9		12.8	15.5	14.1	13.4
56	14.7	12.0	14.6	12.9	10.1		12.7	15.3	0.0	11.5
57	14.6	12.0	14.5	12.7	10.1		12.4	15.2	0.0	11.4
58	14.4	11.9	14.2	12.6	10.1		12.2	15.2	0.0	11.3
59	14.3	11.9	14.1	12.5	10.1		12.1	15.1	0.0	11.3
60	14.1	11.8	14.0	12.4	9.6		11.8	15.0	14.1	12.9
61	14.2	11.8	13.9	12.3	9.4		11.5	14.8	0.0	11.0
62	14.4	11.6	13.7	12.1	9.3		11.3	14.5	0.0	10.9
63	15.0	11.5	13.5	12.1	9.5		11.1	14.3	0.0	10.9
64	15.4	11.5	13.6	11.8	9.7		11.3	14.2	0.0	10.9
65	14.7	11.6	13.7	11.6	9.5		11.4	13.9	13.9	12.5
66	14.3	11.4	14.0	11.3	9.3		11.4	13.6	0.0	10.7
67	14.1	11.0	13.9	11.3	9.1		11.5	13.5	0.0	10.6
68	13.9	10.8	13.9	11.1	8.9		11.6	13.5	0.0	10.5
69	13.8	10.6	13.7	10.8	8.7		11.4	13.6	0.0	10.3
70	13.6	10.5	13.6	10.6	8.5		11.2	13.7	13.6	11.9
71	13.4	10.3	13.4	10.5	9.0		11.1	13.7	0.0	10.2
72	13.2	10.1	13.2	10.4	9.2		10.9	13.5	0.0	10.1
73	13.0	10.0	13.0	10.2	9.2		10.8	13.1	0.0	9.9
74	12.9	9.8	12.9	10.0	9.2		10.8	12.8	0.0	9.8
75	12.7	9.7	12.7	9.8	9.1		10.6	12.6	13.4	11.3
76	12.5	9.6	12.6	9.6	8.9		10.3	12.4	0.0	9.5
77	12.4	9.4	12.6	9.5	8.7		10.1	12.3	0.0	9.4
78	12.3	9.3	12.8	9.3	8.5		10.0	12.2	0.0	9.3
79	12.1	9.3	13.2	9.2	8.4		10.0	12.2	0.0	9.3
80	11.9	9.6	13.6	9.1	8.4		10.0	12.3	13.3	11.0
81	11.8	10.0	14.1	9.1	8.3		10.1	12.1	0.0	9.4
82	11.7	10.4	14.7	9.1	8.3		10.0	12.0	0.0	9.5
83	11.7	10.6	15.2	9.2	8.2		9.8	11.9	0.0	9.6
84	11.6	10.8	15.4	9.3	8.1		9.6	11.9	0.0	9.6
85	11.4	11.1	15.6	9.2	8.0		10.0	12.1	13.3	11.3
86	11.3	11.1	15.6	9.2	7.8		10.7	12.0	0.0	9.7
87	11.2	11.2	15.6	9.3	7.7		11.2	11.9	0.0	9.8
88	11.0	11.0	15.4	9.2	7.9		11.2	11.8	0.0	9.7
89	10.9	11.0	15.3	9.2	8.1		10.9	11.9	0.0	9.7
90	10.8	10.9	15.0	9.1	8.5		10.7	12.1	13.6	11.3
91	10.9	10.8	14.9	9.1	8.1		10.4	12.2	0.0	9.6

Missing data (blanks) are due to equipment malfuntion.

Table AII-5 (cont.)

Cold Condition
Toe Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
92	11.3	10.9	14.8	9.0	8.3		10.1	12.2	0.0	9.6
93	12.1	11.1	14.7	8.8	8.4		10.1	12.2	0.0	9.7
94	12.5	11.1	14.5	8.6	8.4		10.2	12.1	0.0	9.7
95	12.7	10.6	14.4	8.4	7.9		10.2	11.8	13.6	11.2
96	12.5	10.2	14.2	8.2	7.6		10.0	11.6	0.0	9.3
97	12.4	9.9	14.0	8.2	7.4		9.9	11.5	0.0	9.2
98	12.2	9.7	13.7	8.0	7.2		9.9	11.5	0.0	9.0
99	12.0	9.5	13.5	7.8	7.1		9.7	11.6	0.0	8.9
100	11.8	9.4	13.3	7.6	6.9		9.6	11.6	13.5	10.5
101	11.5	9.2	13.2	7.5	7.2		9.4	11.6	0.0	8.7
102	11.4	9.0	13.0	7.4	7.9		9.1	11.6	0.0	8.7
103	11.1	8.9	12.9	7.2	8.1		9.0	11.6	0.0	8.6
104	11.0	8.8	12.8	7.1	8.0		8.9	11.4	0.0	8.5
105	10.9	8.6	12.7	6.9	7.9		9.0	11.3	12.9	10.0
106	10.8	8.4	12.4	6.9	7.7		8.9	11.1	0.0	8.3
107	10.7	8.3	12.3	6.9	7.5		8.7	11.4	0.0	8.2
108	10.6	8.3	12.1	7.2	7.5		9.2	11.6	0.0	8.3
109	10.4	8.5	12.1	7.4	8.0		10.6	11.7	0.0	8.6
110	10.3	8.7	12.1	7.5	7.8		11.1	12.0	13.0	10.3
111	10.2	8.8	12.3	7.6	7.7		10.8	12.1	0.0	8.7
112	10.1	9.4	13.1	7.5	7.7		10.4	12.4	0.0	8.8
113	10.0	10.7	14.0	7.6	7.7		10.1	12.5	0.0	9.1
114	10.0	12.0	14.7	7.6	8.3		9.8	12.5	0.0	9.4
115	9.9	12.9	15.0	7.6	8.7		9.6	12.6	13.3	11.2
116	9.8	13.3	15.3	7.5	8.8		9.5	12.6	0.0	9.6
117	9.7	13.7	15.5	7.4	8.1		9.4	12.6	0.0	9.6
118	9.6	14.2	15.6	7.4	8.1		9.4	12.5	0.0	9.6
119	9.5	14.4	15.8	7.3	7.7		9.6	12.4	0.0	9.6
120	9.4	14.5	15.9	7.3	7.7		9.8	12.3	13.5	11.3
121	9.4	14.4	15.7	7.3	7.2		9.6	12.1	0.0	9.5
122	9.7	14.4	15.5	7.2	7.2		9.2	12.1	0.0	9.4
123	10.4	14.6	15.4	7.0	7.2		8.9	12.4	0.0	9.5
124	10.6	14.8	15.1	6.9	6.9		8.8	12.7	0.0	9.5
125	10.7	14.8	14.9	6.9	7.0		9.3	12.7	13.1	11.2
126	10.5	14.0	14.8	7.0	7.6		9.8	12.2	0.0	9.5
127	10.3	13.5	14.7	7.0	8.9		9.5	11.9	0.0	9.5
128	10.1	13.1	14.5	6.9	11.6		9.2	11.8	0.0	9.7
129	10.0	12.8	14.3	6.9	12.4		9.0	11.8	0.0	9.7
130	9.8	12.4	14.0	6.9	12.2		8.7	11.8	13.1	11.1
131	9.7	12.0	13.8	6.8	11.7		8.4	11.6	0.0	9.3
132	9.6	11.8	13.5	6.9	11.2		8.2	11.5	0.0	9.1
133	9.5	11.6	13.3	6.9	10.8		8.2	11.4	0.0	9.0
134	9.5	11.4	13.2	6.9	10.4		8.1	11.1	0.0	8.8
135	9.4	11.1	12.9	6.8	10.0		7.9	10.9	12.8	10.2
136	9.2	11.0	12.7	6.6	9.6		7.7	10.8	0.0	8.5
137	9.1	11.1	12.5	6.4	9.3		7.6	10.8	0.0	8.4

Missing data (blanks) are due to equipment malfuntion.

Table AII-5 (cont.)

Cold Condition
Toe Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
138	9.0	11.3	12.2	6.2	9.0		7.6	10.6	0.0	8.2
139	8.9	11.5	12.1	6.2	8.8		8.3	10.6	0.0	8.3
140	8.9	11.5	12.1	6.1	8.5		10.3	11.0	12.6	10.1
141	8.8	11.4	12.2	6.0	8.5		10.7	11.5	0.0	8.6
142	9.0	11.3	12.1	5.9	8.5		10.3	12.2	0.0	8.7
143	9.1	11.1	12.0	5.8	8.0		9.9	13.0	0.0	8.6
144	9.2	11.0	12.2	5.6	8.3		9.5	13.1	0.0	8.6
145	9.2	10.8	12.5	5.6	8.4		9.2	12.9	13.3	10.2
146	9.1	10.7	13.0	5.7	7.7		9.0	13.0	0.0	8.5
147	9.1	10.6	13.4	6.1	7.2		8.8	13.3	0.0	8.6
148	9.0	10.4	13.8	6.6	7.0		8.7	13.2	0.0	8.6
149	9.0	10.1	13.8	7.0	6.9		8.7	13.1	0.0	8.6
150	8.9	10.1	14.0	7.1	6.7		8.7	13.2	13.0	10.2
151	9.0	10.2	13.9	7.2	6.5		8.4	13.2	0.0	8.6
152	9.1	10.4	13.7	7.3	6.8		8.2	13.1	0.0	8.6
153	9.2	10.5	13.4	7.3	6.6		8.1	13.0	0.0	8.5
154	9.0	10.3	13.2	7.3	6.8		8.1	12.9	0.0	8.5
155	8.9	9.5	13.2	7.2	6.4		8.3	12.6	12.8	9.9
156	8.9	9.2	13.0	7.1	6.1		8.1	12.2	0.0	8.1
157	8.8	8.9	12.9	6.9	5.9		8.0	11.9	0.0	7.9
158	8.8	8.6	12.7	6.7	5.9		7.8	11.7	0.0	7.8
159	8.7	8.4	12.7	6.4	6.0		7.6	11.4	0.0	7.7
160	8.6	8.2	12.6	6.3	6.1		7.4	11.2	12.9	9.2
161	8.5	8.0	12.3	6.2	6.3		7.3	11.2	0.0	7.5
162	8.4	7.7	12.2	6.1	6.9		7.2	11.0	0.0	7.4
163	8.3	7.8	11.9	6.0	7.1		7.2	10.8	0.0	7.4
164	8.2	8.1	11.8	6.0	7.0		7.1	10.7	0.0	7.4
165	8.1	8.4	11.7	5.8	6.9		7.0	10.6	12.7	8.9
166	8.1	8.9	11.7	5.6	6.8		7.4	10.5	0.0	7.4
167	8.1	9.3	11.7	5.5	7.0		9.3	10.2	0.0	7.6
168	8.1	9.4	11.5	5.3	6.5		11.4	10.4	0.0	7.8
169	8.2	9.6	11.6	5.3	6.8		11.8	10.9	0.0	8.0
170	8.2	9.6	11.7	5.7	7.0		11.4	11.8	12.4	9.7
171	8.2	9.6	11.6	6.2	6.8		10.9	12.5	0.0	8.2
172	8.4	9.6	11.6	6.7	6.7		10.4	12.8	0.0	8.3
173	8.4	9.5	11.7	7.1	7.0		10.0	13.1	0.0	8.4
174	8.5	9.4	12.1	7.5	7.1		9.7	13.1	0.0	8.4
175	8.5	9.4	12.6	7.7	6.9		9.5	12.9	13.1	10.1
176	8.6	9.2	13.1	7.9	6.4		9.2	12.7	0.0	8.4
177	9.0	9.3	13.8	8.1	6.2		8.8	12.6	0.0	8.5
178	9.2	9.5	14.5	8.2	6.2		8.5	12.6	0.0	8.6
179	9.1	9.9	15.1	8.0	6.2		8.3	12.4	0.0	8.6

Missing data (blanks) are due to equipment malfuntion.

Table AII-5 (cont.)

SST Condition
Toe Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
0	29.4	28.9	26.2	25.4	22.0		30.0	25.3		26.7
1	29.7	29.0	26.3	25.4	22.0		30.0			27.1
2	29.6	28.9	26.3	25.4	22.0		29.6			27.0
3	29.3	28.8	26.2	25.3	22.0		29.0			26.8
4	29.0	28.6	26.0	25.2	22.0		28.6			26.6
5	28.7	28.2	25.9	25.0	21.7		28.2	25.4		26.2
6	28.5	28.0	25.8	24.9	21.6		28.0			26.1
7	28.1	27.4	25.6	24.7	21.4		27.8			25.8
8	27.7	26.5	25.4	24.5	21.3		27.6			25.5
9	27.4	26.0	25.3	24.2	21.1		27.4			25.2
10	27.0	25.6	24.9	24.0	21.0		27.2	23.5		24.7
11	26.7	25.2	24.6	23.7	20.9		27.1			24.7
12	26.3	24.9	24.3	23.3	20.9		27.1			24.5
13	26.0	24.4	24.1	23.0	20.8		27.0			24.2
14	25.6	24.0	23.9	22.8	20.5		26.9			24.0
15	25.2	23.7	23.6	22.5	20.4		26.8	23.0		23.6
16	24.9	23.4	23.5	22.1	20.1		26.7			23.5
17	24.6	22.8	23.1	21.9	20.1		26.6			23.2
18	24.2	22.5	22.8	21.6	20.1		26.5			23.0
19	23.8	21.8	22.5	21.3	20.1		26.5			22.7
20	23.4	21.3	22.2	21.1	19.9		26.3	21.8		22.3
21	23.0	21.1	22.0	20.8	19.8		26.4			22.2
22	22.7	20.8	21.7	20.4	19.5		26.3			21.9
23	22.5	20.4	21.5	20.1	19.3		25.8			21.6
24	22.1	20.1	21.3	19.8	19.1		25.9			21.4
25	21.8	19.8	21.1	19.5	18.9		25.8	20.5		21.1
26	21.4	19.5	20.9	19.2	18.6		25.9			20.9
27	21.1	19.1	20.7	19.1	18.4		26.0			20.7
28	20.8	18.7	20.4	18.9	18.2		26.3			20.6
29	20.4	18.4	20.1	18.7	18.0		26.6			20.4
30	20.1	18.1	19.8	18.4	17.8		26.0	19.3		19.9
31	19.7	17.8	19.6	18.2	17.4		25.8			19.8
32	19.5	17.5	19.3	17.9	17.0		25.7			19.5
33	19.2	16.7	19.1	17.5	16.9		25.6			19.2
34	19.0	15.9	18.9	17.3	16.8		25.5			18.9
35	18.7	15.3	18.6	17.2	16.6		25.3	17.9		18.5
36	18.5	15.7	18.3	16.9	16.3		25.4			18.5
37	18.0	15.5	17.9	16.8	15.8		25.6			18.3
38	17.7	15.4	17.7	16.6	15.5		25.5			18.1
39	17.4	15.2	17.4	16.2	15.3		25.4			17.8
40	17.0	15.0	17.2	15.9	15.1		25.3	16.9		17.5
41	16.8	14.6	17.0	15.7	15.0		25.0			17.4
42	16.5	14.3	16.7	15.5	14.8		24.8			17.1
43	16.3	14.0	16.4	15.4	14.7		25.6			17.1
44	16.1	13.9	16.1	15.2	14.5		26.0			17.0
45	15.8	13.8	15.9	15.0	14.3		25.7	15.3		16.5

Missing data (blanks) are due to equipment malfuntion.

Table AII-5 (cont.)

SST Condition
Toe Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
46	15.6	13.6	15.6	14.9	14.1		25.4			16.5
47	15.3	13.0	15.4	14.7	13.9		25.2			16.3
48	15.0	12.8	15.3	14.6	14.0		25.1			16.1
49	14.9	12.4	15.2	14.4	14.2		24.9			16.0
50	15.0	12.0	15.2	14.2	14.3		24.6	15.4		15.8
51	15.1	11.6	15.1	14.1	14.3		24.0			15.7
52	15.1	11.0	15.0	14.0	14.1		24.5			15.6
53	15.0	10.4	15.0	13.8	14.1		24.7			15.5
54	14.9	10.3	15.0	13.7	14.1		24.5			15.4
55	14.7	10.9	14.9	13.7	14.0		24.5	14.3		15.3
56	14.6	11.3	14.7	13.6	14.0		24.5			15.5
57	14.4	11.3	14.5	13.5	13.9		24.5			15.4
58	14.3		14.3	13.5	13.8		24.5			16.1
59	14.3	9.5	14.1	13.4	13.6		24.4			14.9
60	14.1	8.9	13.9	13.4	13.4		24.4	13.9		14.6
61	14.0	8.7	13.6	13.4	13.2		24.4			14.6
62	13.9	8.7	13.5	13.3	13.0		23.8			14.4
63	13.7	8.2	13.7	13.2	12.7		23.8			14.2
64	13.4	8.7	13.7	13.3	12.5		23.4			14.2
65	13.4	8.9	13.6	13.5	12.4		23.6	13.3		14.1
66	13.3	8.9	13.4	13.6	12.2		23.3			14.1
67	13.3	8.8	13.4	13.6	12.1		23.0			14.0
68	13.1	8.5	13.2	13.4	11.9		22.6			13.8
69	13.0	8.3	13.0	13.2	11.7		22.3			13.6
70	12.8	8.1	13.0	13.1	11.5		22.0	13.1		13.4
71	12.6	8.2	12.9	13.1	11.4		21.6			13.3
72	12.4	8.2	12.7	13.1	11.3		21.2			13.2
73	12.2	8.3	12.6	13.0	11.0		21.1			13.0
74	11.9	8.4	12.5	13.0	10.9		21.1			13.0
75	11.7	8.2	12.3	13.0	11.0		20.8	12.7		12.8
76	11.5	7.8	12.4	12.9	10.8		20.5			12.7
77	11.3	7.6	12.4	12.9	10.6		20.5			12.6
78	11.1	7.5	12.9	12.8	10.4		20.6			12.6
79	10.9	7.3	13.7	12.7	10.3		21.6			12.8
80	10.7	8.2	14.3	12.8	10.1		21.6	13.0		13.0
81	10.7	8.4	14.3	12.8	10.0		21.7			13.0
82	11.1	8.1	14.2	12.9	10.0		21.4			13.0
83	11.3	8.0	14.0	13.1	10.3		21.3			13.0
84	11.5	8.1	13.7	13.2	10.6		21.2			13.1
85	11.8	7.9	13.4	13.2	10.9		21.6	13.1		13.1
86	12.0	7.8	13.4	13.2	11.0		21.5			13.2
87	12.2	7.8	13.3	13.1	11.0		21.5			13.2
88	12.3	7.6	13.1	13.1	10.9		21.5			13.1
89	12.3	7.7	13.0	13.0	10.9		22.3			13.2
90	12.3	7.9	13.0	12.9	10.9		22.7	12.6		13.2
91	12.3	8.6	12.8	12.8	10.8		23.5			13.5

Missing data (blanks) are due to equipment malfuntion.

Table AII-5 (cont.)

SST Condition
Toe Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
92	12.2	8.9	12.5	12.9	10.7		23.0			13.4
93	12.1	9.0	12.4	13.0	10.6		23.0			13.4
94	12.0	8.1	12.5	13.1	10.5		22.9			13.2
95	11.9	7.8	12.8	13.1	10.4		22.9	11.9		13.0
96	12.0	8.2	13.0	13.1	10.3		22.7			13.2
97	12.2	7.4	13.0	13.0	10.2		22.6			13.1
98	12.2	7.2	12.9	13.0	10.1		22.5			13.0
99	12.2	7.5	12.8	12.9	10.0		22.4			13.0
100	12.0	7.4	12.5	12.7	10.0		22.4	11.9		12.7
101	11.8	7.2	12.3	12.7	9.9		21.8			12.6
102	11.7	7.1	12.1	12.7	9.8		21.8			12.5
103	11.5	6.8	12.1	12.6	9.7		21.5			12.4
104	11.3	6.7	12.0	12.5	9.5		21.4			12.2
105	11.0	6.5	12.2	12.5	9.5		20.4	11.9		12.0
106	10.8	6.5	12.1	12.5	9.4		20.2			11.9
107	10.6	6.5	12.0	12.5	9.2		20.4			11.9
108	10.3	6.3	12.1	12.5	9.0		20.5			11.8
109	10.0	6.1	12.1	12.7	8.9		20.8			11.8
110	9.9	5.9	12.0	12.8	9.0		21.0	12.5		11.9
111	9.7	6.3	11.9	12.8	9.2		23.2			12.2
112	9.7	6.5	11.8	12.8	9.5		25.3			12.6
113	9.9	6.5	11.9	12.9	9.6		25.3			12.7
114	10.4	6.2	12.4	13.1	9.7		25.5			12.9
115	10.9	6.1	13.1	13.1	9.7		25.5	11.9		12.9
116	11.1	6.5	14.1	13.1	9.6		24.8			13.2
117	11.4	6.6	14.7	13.1	9.6		24.5			13.3
118	11.6	6.7	15.2	13.1	9.5		24.3			13.4
119	11.8	6.6	15.6	13.0	9.4		24.1			13.4
120	11.8	6.6	16.1	12.9	9.3		24.1	11.8		13.2
121	11.8	6.4	16.2	13.1	9.2		23.7			13.4
122	11.9	6.3	16.2	13.2	9.0		24.2			13.5
123	11.9	5.8	16.0	13.3	8.9		24.4			13.4
124	12.1	5.8	16.1	13.3	8.8		24.4			13.4
125	12.5	5.8	16.1	13.3	9.0		24.1	12.1		13.3
126	12.5	5.8	15.9	13.3	9.2		24.3			13.5
127	12.5	5.9	15.7	13.1	9.2		24.3			13.5
128	12.4	6.0	15.5	12.9	9.1		24.1			13.3
129	12.2	6.0	15.1	12.9	9.1		23.9			13.2
130	12.1	5.8	14.9	12.9	8.9		23.6	12.5		13.0
131	11.8	5.6	14.7	12.8	8.7		23.3			12.8
132	11.6	5.5	14.4	12.7	8.6		23.5			12.7
133	11.3	5.2	14.1	12.6	8.5		23.3			12.5
134	11.1	5.1	13.8	12.4	8.4		23.0			12.3
135	10.8	5.1	13.5	12.3	8.3		22.1	11.4		11.9
136	10.5		13.3	12.1	8.1		21.8			13.2
137	10.3		13.1	11.9	8.0		22.1			13.1

Missing data (blanks) are due to equipment malfuntion.

Table AII-5 (cont.)

SST Condition
Toe Temperatures

Time (minutes)	1	2	3	4	5	6	7	8	9	Mean
138	10.3		12.8	11.9	8.1		22.3			13.1
139	10.6	5.0	12.8	11.9	8.6		22.6			11.9
140	11.0	5.2	13.1	12.1	9.3		22.9	11.7		12.2
141	11.2	5.5	13.1	12.5	9.7		23.1			12.5
142	11.4	5.9	13.0	12.6	9.7		23.1			12.6
143	11.6	6.3	12.9	12.6	9.6		23.3			12.7
144	11.7	6.6	12.6	12.6	9.5		23.3			12.7
145	11.8	6.6	12.4	12.6	9.4		23.3	12.0		12.6
146	11.9	6.3	12.2	12.6	9.2		23.2			12.6
147	12.0	6.3	12.0	12.6	9.1		23.0			12.5
148	12.3	6.3	11.9	12.6	8.9		22.8			12.5
149	12.3	6.2	11.7	12.7	8.8		22.7			12.4
150	12.3	6.3	11.6	12.8	8.6		22.8	11.9		12.3
151	12.2	6.1	11.4	12.8	8.6		22.8			12.3
152	12.0	6.2	11.2	12.8	8.4		23.2			12.3
153	11.9	5.8	11.3	12.9	8.3		23.4			12.3
154	11.9	5.8	11.9	13.0	8.2		22.9			12.3
155	11.9	5.6	12.6	13.0	8.0		22.7	11.4		12.2
156	11.7	5.7	13.2	12.9	8.0		23.0			12.4
157	11.5	5.8	13.5	12.7	7.9		23.1			12.4
158	11.3	5.7	13.2	12.7	7.6		22.9			12.2
159	11.0	5.5	12.9	12.8	7.4		22.9			12.1
160	10.8	5.4	12.6	12.8	7.3		22.5	11.3		11.8
161	10.5		12.4	12.7	7.3		22.4			13.1
162	10.2	5.0	12.1	12.6	7.3		22.3			11.6
163	10.0	5.0	12.0	12.5	7.2		22.3			11.5
164	9.7	5.0	11.8	12.4	7.0		21.3			11.2
165	9.5		11.5	12.2	6.9		20.9	11.4		12.1
166	9.4	5.0	11.3	12.1	6.9		20.8			10.9
167	9.6		11.3	12.0	7.4		21.1			12.3
168	10.5		11.7	12.0	8.3		22.0			12.9
169	11.3		12.8	12.1	9.3		23.5			13.8
170	11.8	5.0	13.9	12.3	10.0		23.6	11.7		12.6
171	12.4	5.0	14.8	12.2	10.3		23.7			13.1
172	13.1	5.2	15.3	12.3	10.3		23.7			13.3
173	13.2	5.6	15.4	12.5	10.2		23.7			13.4
174	13.3	5.6	15.3		10.1		23.7			13.6
175	13.4	5.7	15.2	12.4	9.9		23.5	12.2		13.2
176	28.9	5.8	15.0		9.8		23.6			16.6
177	29.0	6.0	14.7		9.6		23.5			16.6
178	28.9	6.2	14.6		9.4		23.2			16.5
179	28.8	6.2			9.2		23.4			16.9

Missing data (blanks) are due to equipment malfuntion.

Appendix III

Perception Data

Table AIII-1.

Comfort Perception of Fingers

Warm

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	99	98	97	97	99	97	100	99	98	98.2
30	99	90	99	96	100	98	100	96	99	97.4
60	98	96	100	97	100	98	100	96	97	98.0
90	99	97	100	97	100	97	99	92	97	97.6
120	99	99	96	96	100	98	99	95	97	97.7
150	97	96	90	96	99	97	99	95	98	96.3
180	99	98	93	95	99	98	100	97	97	97.3

Cold

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	99	98	100	98	100	96	99	98	98	98.4
30	17	40	29	94	65	88	76	78	78	62.8
60	10	0	16	89	68	56	27	86	60	45.8
90	6	0	7	80	9	23	1	55	51	25.8
120	2	0	16	72	4	53	0	58	63	29.8
150	2	0	22	65	4	48	1	54	61	28.6
180	2	0	5	52	1	56	0	47	74	26.3

SST

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	98	98		97	99	99	100		97	98.3
30	46	2		93	84	88	89		98	71.4
60	16	2		93	26	88	0		90	45.0
90	7	1		82	13	90	2		87	40.3
120	6	0		66	7	68	2		64	30.4
150	5	0		65	5	54	0		77	29.4
180	2	0		49	3	52	0		67	24.7

0 = uncomfortable
100 = comfortable

Blanks in tables are data missing due to technical problems during the experiment.

Table AIII-2.

Comfort Perception of Toes

Warm

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	99	99	98	98	100	98	99	98	98	98.6
30	99	91	99	96	100	97	100	97	99	97.6
60	98	97	99	97	100	99	100	97	99	98.4
90	98	98	100	98	100	98	100	97	99	98.7
120	98	98	95	98	100	98	100	95	97	97.7
150	98	98	95	96	100	98	100	96	98	97.7
180	98	98	92	95	99	98	100	95	98	97.0

Cold

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	98	98	100	97	99	98	99	97	99	98.3
30	76	14	85	96	76	81	85	78	99	76.7
60	7	0	14	90	54	53	4	71	67	40.0
90	3	0	17	74	24	7	2	36	40	22.6
120	2	0	3	71	6	3	0	34	41	17.8
150	2	0	4	58	0	3	1	18	23	12.1
180	1	0	0	35	0	3	0	22	11	8.0

SST

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	98	97		97	99	98	100		100	98.4
30	32	99		95	78	89	90		97	82.9
60	6	22		92	13	62	17		79	41.6
90	4	2		75	0	6	1		53	20.1
120	2	0		58	3	3	0		17	11.9
150	2	0		62	0	3	0		5	10.3
180	0	0		37	0	4	1		0	6.0

0 = uncomfortable
100 = comfortable

Blanks in tables are data missing due to technical problems during the experiment.

Table AIII-3.

Comfort Perception of "Rest of Body" (excluding fingers & toes)

Warm

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	98	99	98	98	100	98	99	99	98	98.6
30	98	92	100	97	100	98	99	99	98	97.9
60	98	96	100	98	96	99	100	97	98	98.0
90	98	96	100	96	98	97	100	98	99	98.0
120	98	98	99	96	100	98	100	97	99	98.3
150	97	98	97	97	96	97	100	93	95	96.7
180	98	90	9	97	98	97	100	95	97	86.8

Cold

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	98	98	100	96	90	98	97	97	99	97.0
30	19	20	14	93	79	69	82	56	69	55.7
60	18	0	8	86	35	48	36	56	64	39.0
90	3	0	25	75	12	19	23	46	66	29.9
120	4	0	23	67	12	27	1	41	67	26.9
150	5	0	27	59	7	28	2	36	67	25.7
180	3	0	23	50	1	36	0	33	72	24.2

SST

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	98	98		97	100	98	100		98	98.4
30	61	51		96	59	69	54		89	68.4
60	19	0		84	23	65	10		77	39.7
90	14	1		75	19	45	3		73	32.9
120	3	1		62	5	45	0		54	24.3
150	4	0		65	0	46	0		55	24.3
180	3	0		46	7	30	0		50	19.4

0 = unomfortable
100 = comfortable

Blanks in tables are data missing due to technical problems during the experiment.

Table AIII-4.

Temperature Perception of Fingers

Warm

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	98	93	99	97	100	98	98	97	99	97.7
30	99	96	100	98	98	99	100	97	98	98.3
60	98	97	99	97	99	99	100	96	98	98.1
90	99	92	100	96	100	98	100	96	98	97.7
120	98	97	98	96	97	98	100	95	99	97.6
150	98	99	90	96	100	98	100	92	97	96.7
180	98	97	94	95	99	97	100	94	98	96.9

Cold

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	97	97	100	97	96	99	91	97	99	97.0
30	47	32	33	92	57	60	55	84	66	58.4
60	6	7	4	84	68	30	27	74	58	39.8
90	5	0	4	67	8	5	0	55	56	22.2
120	4	0	7	53	4	37	1	52	68	25.1
150	3	0	9	32	2	37	0	40	56	19.9
180	1	0	3	19	3	49	1	29	68	19.2

SST

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	99	98		97	99	97	100		99	98.4
30	22	1		89	43	84	50		97	55.1
60	26	0		77	10	85	2		79	39.9
90	8	2		71	15	85	3		74	36.9
120	5	0		39	3	70	2		72	27.3
150	8	0		47	4	69	0		80	29.7
180	3	0		27	3	70	0		51	22.0

0 = cold
100 = warm

Blanks in tables are data missing due to technical problems during the experiment.

Table AIII-5.

Temperature Perception of Toes

Warm

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	98	93	100	97	100	98	99	96	98	97.7
30	98	96	99	98	99	98	100	99	98	98.3
60	97	100	100	96	100	98	100	97	99	98.6
90	98	97	100	97	100	97	100	94	99	98.0
120	98	96	96	96	99	97	100	95	98	97.2
150	97	100	93	97	100	97	100	92	98	97.1
180	98	98	92	95	98	97	100	95	98	96.8

Cold

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	97	98	100	97	95	99	100	97	99	98.0
30	63	11	68	94	77	63	68	82	66	65.8
60	4	0	22	80	34	30	2	66	58	32.9
90	3	0	4	66	14	5	0	56	56	22.7
120	3	1	3	52	3	1	3	32	68	18.4
150	2	0	2	29	0	1	0	16	56	11.8
180	1	0	0	13	0	2	0	10	68	10.4

SST

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	99	98		97	100	98	100		98	98.6
30	38	50		95	82	86	46		98	70.7
60	5	33		81	11	63	1		68	37.4
90	3	0		63	3	5	2		45	17.3
120	2	1		34	0	3	0		12	7.4
150	0	0		36	0	4	0		2	6.0
180	0	0		29	0	4	0		3	5.1

0 = cold
100 = warm

Blanks in tables are data missing due to technical problems during the experiment.

Table AIII-6.

Temperature Perception of "Rest of Body" (excluding fingers & toes)

Warm

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	98	93	99	97	99	99	99	97	99	97.8
30	99	95	100	97	96	97	100	97	98	97.7
60	98	97	100	97	93	97	100	97	99	97.6
90	97	98	100	97	95	98	100	93	89	96.3
120	98	96	97	97	96	98	100	95	95	96.9
150	98	99	94	94	96	97	100	92	95	96.1
180	99	89	93	96	99	97	100	94	97	96.0

Cold

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	97	98	100	97	99	100	94	98	99	98.0
30	33	10	12	91	81	60	82	61	71	55.7
60	17	0	34	83	31	26	25	54	69	37.7
90	10	0	30	72	11	13	13	55	67	30.1
120	11	0	14	49	20	25	3	49	69	26.7
150	5	0	12	23	8	26	1	32	65	19.1
180	4	0	33	15	7	41	0	24	67	21.2

SST

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	98	93	99	97	99	99	99	97	99	97.8
30	99	95	100	97	96	97	100	97	98	97.7
60	98	97	100	97	93	97	100	97	99	97.6
90	97	98	100	97	95	98	100	93	89	96.3
120	98	96	97	97	96	98	100	95	95	96.9
150	98	99	94	94	96	97	100	92	95	96.1
180	99	89	93	96	99	97	100	94	97	96.0

0 = cold
100 = warm

Blanks in tables are data missing due to technical problems during the experiment.

Appendix IV

Firearms Data

Table AIV-1.

Pistol Reloading Times in Seconds

Warm

loading occurence	1	2	3	4	5	6	7	8	9	mean
1	27	31	49	25	42	20	37	34	30	33.1
2	31	29	41	31	40	27	59	19	31	34.6
3	30	32	47	25	32	18	32	34	29	31.3
4	29	31	35	40	37	29	31	29	63	32.6
5	24	33	35	23	29	24	31	32	31	28.9
6	33	32	37	33	35	27	23	24	36	30.5
7	29	31	39	27	32	28	23	33	36	30.3
8	37	34	39	29	33	31	33	35	46	33.9
9	31	33	38	29	30	26	29	28	34	30.5
10	28	29	33	32	26	44	38	19	37	31.1
11	39	35	41	30	28	18	33	29	32	31.6
12	27	33	29	27	30	31	32	27	33	29.5

Cold

loading occurence	1	2	3	4	5	6	7	8	9	mean
1	35	39	47	46	55	22	30	30	29	29.0
2	30	35	35	34	30	33	30	28	40	40.0
3	30	40	54	68	55	27	37	31	33	33.0
4	41	43	46	52	36	30	48	38	43	43.0
5	36	42	49	50	56	40	31	34	43	43.0
6	38	58	47	47	40	45	37	29	38	38.0
7	38	36	43	45	57	33	39	32	34	34.0
8	42	42	39	65	39	60	40	34	37	37.0
9	39	49	50	46	62	30	41	37	33	33.0
10	36	39	51	45	45	44	32	32	39	39.0
11	25	40	48	48	56	17	28	41	28	28.0
12	16	38	41	40	33	41	37	43	46	46.0

SST

loading occurence	1	2	3	4	5	6	7	8	9	mean
1	31	30	35	29	32		32	25	36	36.0
2	29	31	34	47	38		31	30	35	35.0
3	29	35	43	36	43	39	36	11	37	37.0
4	33	35	48	46	39	48	44	43	44	44.0
5	51	39	44	46	42	32	35	37	46	46.0
6	41	9	49	50	47	37	50	42	43	43.0
7	33	38	49	45	41	22	25	13	43	43.0
8	33	42	48	46	37	40	42	38	37	37.0
9	27	43	67	40	39	19	37	23	55	55.0
10	40	33	35	41	36	33	44	33	59	59.0
11	27	33	51	34	49	13		36	39	39.0
12	27	38	42	50	37	37		36	41	41.0

Blanks in tables are data missing due to technical problems during the experiment.

Table AIV-2.

Rifle Reloading Times in Seconds

Warm

loading occurence	1	2	3	4	5	6	7	8	9	mean
1	14	13	13	9	17	10	14	15	11	12.9
2	16	12	13	9	15	11	21	18	13	14.2
3	14	11	12	11	10	7	9	25	11	12.2
4	16	13	15	10	16	15	3	15	14	13.0
5	12	12	11	11	18	10	10	16	11	12.3
6	17	11	17	12	18	15	12	16	14	14.7
7	12	12	17	10	22	9	9	17	9	13.0
8	15	12	15	14	15	11	10	14	14	13.3
9	15	12	13	10	17	8	20	20	10	13.9
10	16	11	19	9	14	9	14	19	11	13.6
11	13	10	11	10	19	7	15	19	11	12.8
12	19	13	14	12	18	8	16	18	5	13.7

Cold

loading occurence	1	2	3	4	5	6	7	8	9	mean
1	9	14	10	12	19	6	11	16	16	12.6
2	15	12	16	10	16	9	16	11	16	13.4
3	21	13	12	12	17	5	11	18	13	13.6
4	14	15	12	14	24	12	14	17	14	15.1
5	14	13	14	17	17	9	13	20	13	14.4
6	12	14	9	13	20	10	15	17	14	13.8
7	16	11	23	12	19	8	13	14	15	14.6
8	13	12	12	14	22	8	21	15	19	15.1
9	11	16	19	13	16	6	8	20	14	13.7
10	12	12	15	16	25	9	14	15	13	14.6
11	10	14	15	14	18	5	19	23	22	15.6
12	13	13	15	16	19	8	12	17	21	14.9

SST

loading occurence	1	2	3	4	5	6	7	8	9	mean
1	17	14	12	19	15		15	11	16	14.9
2	22	13	9	9	15		19	21	15	15.4
3	13	11	14	16	14	14	15	13	19	14.3
4	6	13	13	10	17	11	8	24	15	13.0
5	10	16	12	15	12	6	12	10	16	12.1
6	13	13	13	17	17	13	13	23	13	15.0
7	15	15	14	14	14	6	10	12	12	12.4
8	14	11	14	15	19	7	15	10	14	13.2
9	13	11	15	14	10	4	13	12	15	11.9
10	19	11	16	13	16	8	16	14	27	15.6
11	13	14	17	15	15	10		13	21	14.8
12	16	12	10	14	17	8		15	16	13.5

Blanks in tables are data missing due to technical problems during the experiment.

Table AIV-3.

Pistol Shot Groupings

Warm

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	0.47	0.58	0.53	0.77	0.49	0.53	0.39	0.70	0.18	0.52
30	0.31	1.04	0.50	0.68	0.61	0.40	0.46	0.52	0.22	0.53
60	0.35	1.14	0.50	0.58	0.61	0.35	0.41	0.57	0.20	0.53
90	0.41	0.92	0.55	0.48	0.43	0.25	0.48	1.07	0.24	0.54
120		1.00	0.42	0.62	0.60	0.35	0.36	0.95	0.22	0.57
150	0.28	0.68	0.43	0.55	0.51	0.42	0.45	0.84	0.25	0.49

Cold

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	0.72	0.84	0.29	0.52	0.92	0.30	1.08	0.54	0.25	0.61
30	0.54	1.27	0.50	0.56	0.53	0.35	0.69	0.90	0.22	0.62
60	0.63	1.19	0.35	0.58	0.63	0.38	0.67		0.20	0.58
90	0.58	0.96	0.54	0.72	0.78	0.40	0.63	0.72	0.23	0.62
120	0.38	0.99	0.66	0.76	0.72	0.34	0.81	0.40	0.31	0.60
150	0.40	1.10	0.58	0.93	0.68		0.46	0.39	0.29	0.60

SST

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	0.58	1.10	0.82	0.71	0.99	0.43		0.74	0.35	0.71
30	0.82	1.03	0.66	0.57	0.76	0.55	0.52	0.71	0.23	0.65
60	0.81	1.21	0.76	0.54	0.79	0.56	0.53	0.79	0.28	0.70
90	0.73	1.41	0.87	0.38	0.91	0.52	1.13	0.74	0.34	0.78
120	0.87	1.03		0.61	0.70	0.63	0.82	1.08	0.31	0.76
150	0.82	1.27	0.60		0.79	0.54	1.11	0.59	0.22	0.74

Average distance between shots in inches.

Blanks in tables are data missing due to technical problems during the experiment.

Table AIV-4.

Rifle Shot Groupings

Warm

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	0.23	0.57	0.37	0.52	0.36	0.29	0.32	0.38	0.35	0.38
30	0.32	0.39	0.25	0.44	0.41	0.31	0.49	0.45	0.33	0.38
60	0.33	0.52	0.22	0.42	0.35	0.27	0.27	0.54	0.69	0.40
90	0.23	0.58	0.23	1.04	0.27	0.29	0.41	0.33	0.36	0.42
120	0.37	0.46	0.27	1.16	0.24	0.40	0.41	0.43	0.18	0.44
150	0.28	0.48	0.33	0.44	0.19	0.32	0.41	0.34	0.33	0.35

Cold

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	0.27	0.63	0.26	0.39	0.34	0.23	0.42	0.27		0.35
30	0.37	0.48	0.37	0.39	0.25	0.32	0.21	0.32	0.45	0.35
60	0.29	0.68	0.28	0.29	0.35	0.41	0.41	0.33	0.41	0.38
90	0.33	0.47	0.40	0.49	0.44	0.28	0.38	0.42	0.29	0.39
120	0.35	0.53	0.41	0.34	0.37	0.51	0.42	0.45	0.27	0.41
150	0.27	0.70	0.29	0.36	0.43	0.30	0.66	0.43		0.43

SST

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	0.45	0.63	0.57	0.57	0.37	0.54	0.49	0.37	0.23	0.47
30	0.38	0.41	0.74	0.55	0.33	0.36	0.72	0.43		0.49
60		0.46	0.63	0.83	0.45	0.56	0.48	0.37	0.35	0.52
90	0.34	0.48	0.59	0.51	0.40	0.37	0.39	0.51	0.35	0.44
120	0.51	0.51	0.89	0.55	0.42	0.42	0.51	0.61	0.36	0.53
150	0.32	1.29	0.57		0.32	0.23		0.50	0.28	0.50

Average distance between shots in inches.

Blanks in tables are data missing due to technical problems during the experiment.

Table AIV-5

Magazine Loading

Warm

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	20	18	19	21	22	17	23	13	22	19.4
30	23	18	20	24	24	22	19	18	23	21.2
60	22	16	22	23	26	22	22	16	29	22.0
90	22	19	21	21	23	17	16	11	23	19.2
120	24	19	21	21	24	23	22	17	29	22.2
150	20	17	22	21	24	28	20	19	30	22.3

Cold

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	21	16	16	20	17	20	16	17	21	18.2
30	20	16	13	19	15	20	13	15	15	16.2
60	23	16	10	16	12	23	20	12	15	16.3
90	13	12	13	16	15	20	15	13	12	14.3
120	24	13	15	12	10	22	13	14	14	15.2
150	19	11	15	12	14	22	13	15	12	14.8

SST

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	20	14	17	18	19	19		14	15	17.0
30	21	15	17	15	20	19	17	15	14	17.0
60	23	11	18	15	17	18	18	13	13	16.2
90	20	13	14	15	11	20	18	15	15	15.7
120	20	9	15	11	17	22	16	12	13	15.0
150	26	9	15	14	14	26	15	15	12	16.2

Number of dummy shells loaded into an AR-15 magazine in 1 minute.

Blanks in tables are data missing due to technical problems during the experiment.

Appendix V

Acceleration and RMS Data

Table AV-1

RMS of Acceleration in Horizontal Plane (x axis).

Warm

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	56	68	85	122	107	198	72	142	97	105.2
30	64	86	102	116	120	104	78	114	92	97.3
60	45	129	79	148	84	99	101	96	130	101.2
90	47	75	88		104	139	89	92	128	95.3
120	41	68	93			74	74	59	78	69.6
150		47	72	130		84	64	75	99	81.6

Cold

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	58	56		128	79	153	127		64	95.0
30	38	89	157	135	136	193	131	77	91	116.3
60	46	175			199	90	111	58	99	111.1
90	58	113	155		102	158	103	68	96	106.6
120	57	166	158		68	159	79	62	119	108.5
150	74	178	121	236	123	142	154	55	75	128.7

SST

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	70	85	93	104	142	147	109	65	117	103.6
30	52	97	100		88	80	113	90	120	92.5
60	88	161	129		96	137	96		118	117.9
90	67	117	137	133	78	137	75	71	89	100.4
120	56	115	140	145	112	135	61	73	135	108.0
150	32	121	113	92	126	165	94		123	108.3

Blanks in tables are data missing due to technical problems during the experiment.

Table AV-2

RMS of Acceleration in Vertical plane (y axis).

Warm

Time (Minutes)	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*mean*
0	94	83	94	128	96	93	90	96	74	94.2
30	123	100	77	116	86	126	69	90	66	94.8
60	104	79	177	133	78	172	98	80	76	110.8
90	178	74	79		93	101	119	85	68	99.6
120		86	96		103	138	92	72	67	93.4
150		81	86	128	78	82	59	84	64	82.8

Cold

Time (Minutes)	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*mean*
0	121	98		136	84	133	114	52	125	107.9
30	79	89	142	117	85	187	96	53	154	111.3
60	66	160		178	125	135	68	60	129	115.1
90	72	117	173	206	159	155	114	61	107	129.3
120		134	143	302	107	101	103	67	258	151.9
150	92	153	120	272	181	116	112	78	94	135.3

SST

Time (Minutes)	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*mean*
0	55	104	85	103	94	147	133	39	85	93.9
30	145	92	83		87	122	91	81	120	102.6
60	58	109	117		83	235	92		90	112.0
90	36	107	103	161	79	138	80	72	80	95.1
120	50	151	173	204	62	78	121	119	120	119.8
150	47	126	97	90	108	123	73		100	95.5

Blanks in tables are data missing due to technical problems during the experiment.

Table AV-3.

RMS of Pectoral Muscles during Pistol Loading.

Warm

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	47	36	30	61	29	52	28	44	99	47.3
30	51	37	26	51	29	67	26	36	113	48.4
60	51	32	30	73	27	64	27	41	98	49.2
90	51	32	31		24	79	26	45	53	42.6
120	55	35	30	50	24	32	27	56	37	38.4
150	53	38	29	38	29	43	29	48	28	37.2

Cold

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	54	52	48	77	41	37	47	31	28	46.1
30	54	71	46	75	41	47	60	27	30	50.1
60	65	73	48	70	35	36	54	30	33	49.3
90	56	69	35	86	44	44	41	32	33	48.9
120	47	76	48	71	41	55	48	38	36	51.1
150	61	68		71	38	48	49	100	40	59.4

SST

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	48	48	38		32	89	39	26	25	43.1
30	48	55	131	33	43	114	51		32	63.4
60	58	65	38	50	38	80	80		33	55.3
90	54	59	37	40	42	87	66		33	52.3
120	51	75	42	57	39		69		31	52.0
150	60	71	44	43	39	144	75		40	64.5

Amplitude of Shiver as expressed by RMS of EMG signal during "Pistol Loading".

Blanks in tables are data missing due to technical problems during the experiment.

Table AV-4.

RMS of Trapezius Muscles during Pistol Loading.

Warm

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	150	100	124	123	113	158	119	140	59	120.7
30	133	93	106	75	99	152	108	140	59	107.2
60	169	78	99	121	98	168	95	159	56	115.9
90	162	80	117	105	90	167	117	162	41	115.7
120	144	76	178	105	105	155	118	136	26	115.9
150	192	91	119	102	101	170	101	135	23	114.9

Cold

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	181	151	177	207	101	136	264	104	86	156.3
30	185	159	160	163	103	142	271	127	84	154.9
60	237	171	170	199	81	134	223	181	148	171.6
90	210	183	195	184	93	183	180	164	131	169.2
120	202	171	162	167	94	184	205	150	116	161.2
150	247	177	170	186	69	161	171	161	129	163.4

SST

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	148	102	103		160	163	121		81	125.4
30	149	101	100	154	152	150	121	137	80	127.1
60	218	108	127	164	188	193	181	194	70	160.3
90	153	90	105	142	169	167	157	124	66	130.3
120	202	109	134	134	269	214	165	187	74	165.3
150	210	101	122	135	164	258	196	170	77	159.2

Amplitude of Shiver as expressed by RMS of EMG signal during "Pistol Loading".

Blanks in tables are data missing due to technical problems during the experiment.

Table AV-5.

RMS of Pectoral Muscles during Pistol Shooting.

Warm

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	90	96	36	114	24	110	71	66	218	91.7
30	61	93	52	97	45	148	69	48	177	87.8
60	87	78	38	101	21	125	66	56	180	83.6
90	78	79	31	84	25	155	68	55	153	80.9
120	60	91	46	81	23	173	68	61	61	73.8
150	48	112	49	67	30	134	69	59	84	72.4

Cold

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	62	102	97	101	64	129	146	73	98	96.9
30	66	152	78	97	51	126	137	66		96.6
60	74	106	79	104	59	111	155	65	101	94.9
90	67	111	39	114	60	104	148	57	104	89.3
120	61	176		103	61	118	170	64	102	106.9
150	68	122		98	52	125	150	56	106	97.1

SST

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	76	96	68		23	148	151	63	153	97.3
30	104	98	60	48	60	148	157		129	100.5
60	91	82	70	54	55	113	150		134	93.6
90	68	81	41	63	55	137	134		129	88.5
120	89	89	46	55	66	123	132		151	93.9
150	42	85	46	58	76	115	146		118	85.8

Amplitude of Shiver as expressed by RMS of EMG signal during "Pistol Shooting".

Blanks in tables are data missing due to technical problems during the experiment.

Table AV-6.

RMS of Trapezius Muscles during Pistol Shooting.

Warm

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	154	165	234		141	178	175	219	230	177.8
30	165	124	174	135	208	237	188	217	221	185.4
60	147	108	212	130	110	194	191	237	218	171.9
90	174	84	117	155	100	254	212	231	213	171.1
120	133	130	157	163	201	244	190	207	78	167.0
150	172	221	194	171	189	265	180	202	92	187.3

Cold

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	186	155	190	175	172	209	294	178	105	184.9
30	195	347	170	190	159	237	345	179	134	217.3
60	183	400	215	193	150	240	348	244	160	237.0
90	200	211	211	159	184	232	339	198	147	209.0
120	210	201	250	155	192	239	375	195	151	218.7
150	211	154	239	229	177	256	379	239	153	226.3

SST

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	144	95	135		194	195	237	166	144	163.8
30	153	62	139	177	238	224	301	195	113	178.0
60	162	203	184	172	307	265	334	229	130	220.7
90	174	170	177	147	314	259	298	164	104	200.8
120	148	181	199	166	282	285	257	231	168	213.0
150	129	166	188	193	331	255	375	232	116	220.6

Amplitude of Shiver as expressed by RMS of EMG signal during "Pistol Shooting".

Blanks in tables are data missing due to technical problems during the experiment.

Table AV-7.

RMS of Pectoral Muscles during Rifle Shooting.

Warm

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	40	90	50	218	50	128	43	99		89.8
30	42	74	43	110	52	134	27	54		67.0
60	39	62	36	111	44	113	21	49		59.4
90	33	39	46	183	33	114	25	57		66.3
120	37	65	36	184	34	142	26	59		72.9
150	32	53	29	82	37	106	27	56		52.8

Cold

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	30	127	64	107	48	54	73	52	74	69.9
30	39	125	49	109	50	52	65	55	68	68.0
60	35	147	49	95	53	47	78	57	81	71.3
90		134	53	109	53	37	74	46	89	74.4
120	34	107	57	91	54	38	75	46	69	63.4
150	38	113	121	97	51	47	84	45	58	72.7

SST

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	28	106	38		50	110	60		61	64.7
30	36	47	31	56	46	86	53		65	52.5
60	32	31	38		46	75	59		64	49.3
90	32	48	34	51	53	83	42		82	53.1
120		61	34	51	52	81	57		78	59.1
150	37	71	32	67	64	110	56		72	63.6

Amplitude of Shiver as expressed by RMS of EMG signal during "Rifle Shooting".

Blanks in tables are data missing due to technical problems during the experiment.

Table AV-8.

RMS of Trapezius Muscles during Rifle Shooting.

Warm

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	170	209	207	233	212	135	112	285	166	192.1
30	165	251	233	151	212	241	110	359	187	212.1
60	197	237	188	168	230	254	109	354	165	211.3
90	175	238	181		168	208	145	352	185	206.5
120	168	265	217		88	250	111	300	70	183.6
150	191	242	219	212	233	203	126	324	69	202.1

Cold

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	267	350	183	188	126	222	149	186	282	217.0
30	299	311	212	154	150	257	215	221	286	233.9
60	307	357	226	197	126	247	239	236	386	257.9
90		360	236	182	[illegible]	260	269	255	367	260.8
120	287	340	234	178	[illegible]	244	317	244	317	255.1
150	243	359	245	218	[illegible]	284	220	219	260	244.3

SST

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	162	297	171		255	195	186	179	207	206.5
30	134	203	156	215	229	275	208	255	204	208.8
60	181	174	223		228	260	180	265	206	214.6
90	176	221	160	193	279	339	192	247	239	227.3
120	343	148	212	193	325	351	243	292	233	260.0
150	151	233	157	233	306	404	205		247	242.0

Amplitude of Shiver as expressed by RMS of EMG signal during "Rifle Shooting".

Blanks in tables are data missing due to technical problems during the experiment.

Table AV-9.

RMS of Pectoral Muscles during Magazine Loading.

Warm

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	31	37	29		23	63	28	63	73	43.4
30	34	30	25		22	58	40		83	41.7
60	42	31	25	50	21	48	35		75	40.9
90	53	27	25	92	25	58	34	54	65	48.1
120	45	27	23	118	24	56	27	48	39	45.2
150	52	27	25	30	26	52	29	53		36.8

Cold

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	47	59	61	62	36	57	64	44	31	51.2
30	46	47	48	83	35	66	59	39	38	51.2
60	49	49	43	77	38	60	67	45	34	51.3
90	50	53	60	73	32	55	52	37	40	50.2
120	49	55	63	81	32	61	57	51	42	54.6
150	56	46		73	34	56	57	100	36	57.3

SST

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	34	32	41		28	49	50	31	40	38.1
30	64	31	39	41	33	53	45		45	43.9
60	68	34	49	53	28	61	64		40	49.6
90	73	44	65	60	34	83	55		51	58.1
120	64	48	40	50	39	99	51		39	53.8
150	59	42	41		46	103	71		50	58.9

Amplitude of Shiver as expressed by RMS of EMG signal during "Magazine Loading".

Blanks in tables are data missing due to technical problems during the experiment.

Table AV-10.

RMS of Trapezius Muscles during Magazine Loading.

Warm

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	169	90	121		102		176	45	124	118.1
30	201	48	73		67	137	29	140	70	95.6
60	236	66	78	90	87	187	39		65	106.0
90	272	68	69	209	98	180	27		65	123.5
120	230	64	69	229	117	202	42	104	63	124.4
150	306	86	77	84	118	178	63	98	31	115.7

Cold

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	278	156	188	172	111		210	192	120	178.4
30	295	149	158	236	112	127	88	56	64	142.8
60	311	178	162	225	113	151	78	67	80	151.7
90	316	189	171	223	94	121	145	103	130	165.8
120	324	235	162	228	97	179	183	39	99	171.8
150	337	184	171	222	101	184	198	77	131	178.3

SST

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	213	74	77		142		259	109	129	143.3
30	330	71	82	159	125	158	115	74	49	129.2
60	389	74	149	175	126	192	116	139	56	157.3
90	323	110	129	223	125	195	125	101	59	154.4
120	641	79	140	193	243	224	148	108	86	206.9
150	361	69	101		167	192	125	161	52	153.5

Amplitude of Shiver as expressed by RMS of EMG signal during "Magazine Loading".

Blanks in tables are data missing due to technical problems during the experiment.

Table AV-11.

RMS of Pectoral Muscles during Metabolic Rate Measurement.

Warm

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	79	41	31	64	25	25	28	52		43.1
30	28	53	25	73	24	24	23	73		40.4
60	26	40	24	76	34	26	36	24		35.8
90	29	45	22	70	22	75	20	38		40.1
120	29	34	26	76	25	60	24	60		41.8
150	27	31	30	41	24	65	29	52		37.4
180	30	29	21	41	22	39	42	27		31.4

Cold

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	37	31	41	140	22	29	29	21	28	42.0
30	103	58	53	130	59	114	88	64	54	80.3
60	75	63	68	121	84	95	92	92	60	83.3
90	138	122	68	128	113	99	135	76	167	116.2
120	88	106	43	152	47	130	132	257	43	110.9
150	92	87	49	135	79	112	82		76	89.0
180	93	86		122	68	49	148	64	77	88.4

SST

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	34	46	33	34	27	36	95	43	33	42.3
30	53	171	32	54	65	160	146		37	89.8
60	195	204	106		66	162	111		77	131.6
90	153	172	72	36	127	367	142		82	143.9
120	187	191	86	39	73	404	183		107	158.8
150	187	142	73	69	83	196	57		106	114.1
180	115	200	125	49	80	193	96		131	123.6

Amplitude of Shiver as expressed by RMS of EMG signal during "Metabolic Rate Measurement".

Blanks in tables are data missing due to technical problems during the experiment.

Table AV-12.

RMS of Trapezius Muscles during Metabolic Rate Measurement.

Warm

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	58	104	27	118	21	36	36	67		58.4
30	22	95	19	142	21	34	46	121		62.5
60	22	85	102	148	44	35	163	59		82.3
90	22	109	20	127	19	73	95	33		62.3
120	22	36	21	206	34	52	21	34		53.3
150	48	104	27	150	72	36	91	35		70.4
180	27	46	21	109	21	28	41	20		39.1

Cold

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	128	147	109	290	111	37	62	23	25	103.6
30	256	121	236	377	231	254	205	128	32	204.4
60	381	227	249	296	219	228	284	149	150	242.6
90	327	307	234	308	220	209	259	60	234	239.8
120	247	383	227	370	241	283	303	239	39	259.1
150	315	410	188	317	220	355	326	148	82	262.3
180	278	384	270	266	227	165	440	66	128	247.1

SST

Time (Minutes)	1	2	3	4	5	6	7	8	9	mean
0	108	155	160	199	67	136	61		24	113.8
30	187	351	59	152	321	352	301	147	68	215.3
60	439	306	208		329	303	321	290	97	286.6
90	351	283	194	234	451	375	296	191	116	276.8
120	425	395	222	152	396	236	392	202	146	285.1
150	453	292	163	234	339	381	298	349	107	290.7
180	392	357	173	181	445	369	296		163	297.0

Amplitude of Shiver as expressed by RMS of EMG signal during "Metabolic Rate Measurement".

Blanks in tables are data missing due to technical problems during the experiment.